TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1938

No. 603

MONTGOMERY WARD & COMPANY, INC.,
PETITIONER,

vs.

THE TOLEDO PRESSED STEEL COMPANY

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SECOND CIRCUIT

PETITION FOR CERTIORARI FILED JANUARY 19, 1939.

CERTIORARI GRANTED FEBRUARY 6, 1939.

ited States Circuit Court of Appeals

FOR THE SECOND CIRCUIT

No. ......

THE TOLEDO PRESSED STEEL COMPANY,
A CORPORATION,

Plaintiff-Appellant,

vs.

MONTGOMERY WARD & COMPANY, INC.,
A CORPORATION,

Defendant-Appellee.

APPEAL FROM THE DISTRICT COURT OF THE UNITED STATES FOR THE EASTERN DISTRICT OF NEW YORK.

TRANSCRIPT OF RECORD

DARBY & DARBY,
Solicitors for Appellant
SAMUEL E. DARBY, JR.
WILBER OWEN
Of Counsel

ANTHONY WILLIAM DELLER,
Solicitor for Appellee
CARL WISNER, JR.
Of Counsel

INDEX

PLAINTIFF'S TESTIMONY

PLAINTIFF'S REBUTTAL

DEFENDANT'S TESTIMONY

Index of Plaintiff's Exhibits

Index of Defendant's Exhibits

In the United States District Court 1

EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY, A CORPORATION, *Plaintiff*, *vs.* MONTGOMERY WARD & CO., INC., A CORPORATION, *Defendant.*	In Equity No. 8417

Bill of Complaint

(Filed November 16, 1937)

TO THE HONORABLE THE JUDGES OF THE DISTRICT COURT OF THE UNITED STATES WITHIN AND FOR THE EASTERN DISTRICT OF NEW YORK. 2

Plaintiff, THE TOLEDO PRESSED STEEL COMPANY, brings this bill of complaint against MONTGOMERY WARD & COMPANY, INC., defendant, and for its cause of action states as follows:

1. Plaintiff is a corporation duly organized and existing under and by virtue of the laws of the State of Ohio, and is a citizen of Ohio, having its principal office and place of business at Toledo, in said State.

2. Defendant, Montgomery, Ward & Company, 3
Inc., is a corporation organized and existing under and by virtue of the laws of the State of Illinois, is a citizen of Illinois and maintains a regular and established place of business in the City of Jamaica in the Eastern District of New York, where the acts of infringement hereinafter complained of were committed.

3. This is a suit in equity arising under the patent laws of the United States, for infringement of United States Letters Patent No. 1,732,708, issued to plaintiff on October 22, 1929.

4 4. Heretofore and before the 25th day of December, 1928, Joseph E. Withrow and Lyman W. Close, both citizens of the United States, residing at Toledo in the State of Ohio, were the original, first and joint inventors of a certain new and useful Burner, not known or used by others in this country before their invention or discovery thereof, not patented or described in any Letters Patent or printed publication in this or any foreign country before their invention or discovery thereof or more than two years prior to their application for the hereinafter mentioned Letters Patent, not in
5 public use or on sale in this country for more than two years prior to the date of their said application for Letters Patent in the United States, not patented in any foreign country upon an application filed more than twelve months prior to their said application for Letters Patent, and not abandoned to the public.

5. On or about December 26th, 1928, the said Joseph E. Withrow and Lyman W. Close, being as aforesaid the original, first and joint inventors of said Burner, made due application to the Commissioner of Patents for Letters Patent of the
6 United States for said invention, and by an instrument in writing, duly executed and delivered by them, assigned and transferred the entire right, title and interest in and to said invention and Letters Patent to plaintiff herein and authorized and requested the Commissioner of Patents to issue the Letters Patent for said invention to said assignee, and having in all respects duly complied with the conditions and requirements of the Acts of Congress in such cases made and provided, on the 22nd day of October, 1929, Letters Patent of the United States for said invention, bearing No.

1,732,708, signed, sealed and executed in due form 7
of law, were issued and delivered over to plain-
tiff, as the assignee of said Joseph E. Withrow and
Lyman W. Close, whereby there was secured unto
plaintiff and its successors and assigns for the
term of seventeen (17) years from said 22nd day
of October, 1929, the sole and exclusive right of
making, using and selling and of granting to others
the right to make, use and sell devices embodying
the said invention, all as by said Letters Patent,
or a duly authenticated copy thereof, here in court
to be produced and shown to Your Honors, will
more fully and at large appear, a copy of said Let- 8
ters Patent, marked "Plaintiff's Exhibit 1," being
attached hereto and made a part hereof.

6. Plaintiff, since the issuance of said Letters
Patent, has invested large sums of money and gone
to great trouble and expense in and about said in-
vention for the purpose of introducing the same
into general use and making it profitable to itself
and useful to the public; has itself made and sold
large numbers of construction torches and truck
flares embodying the said invention and has
granted licenses thereunder to a number of manu-
facturers, including Doray Lamp Company, of Chi- 9
cago, Illinois; K-D Lamp Company, of Cincinnati,
Ohio; R. E. Dietz Company, of New York, N. Y.,
Shanklin Manufacturing Company, of Springfield,
Illinois, and Embury Manufacturing Company, of
Warsaw, New York, each of which licenses has rec-
ognized the validity of said Letters Patent, and has
manufactured and sold construction torches and/or
truck flares embodying the invention of said Let-
ters Patent and paid substantial royalties to plain-
tiff thereunder. Plaintiff and its said licensees
have been and now are ready and able to supply the

10 entire demand of the trade and of the public for torches and flares embodying the invention of said Letters Patent.

7. Plaintiff has caused notice of its said Letters Patent to be given to the public by permanently stamping "Patent No. 1,732,708" on each and every embodiment of said invention sold by it since the issuance of said Letters Patent and has required its said licensees to similarly mark all embodiments of said invention manufactured and sold by them under their said licenses, which requirement has been fully complied with by said licensees,

11 as plaintiff is informed and believes.

8. Notwithstanding the ability of plaintiff and its said licensees to supply the requirements of the trade and the public with construction torches and flares embodying the invention of said Letters Patent, other manufacturers have disregarded plaintiff's rights under said Letters Patent and have, without right or authority, manufactured and sold construction torches and flares in infringement thereof. In January, 1934, plaintiff brought suits in the United States District Court for the Northern District of Ohio, Western Division

12 against dealers who were selling infringing truck flares which were manufactured by The Bolser Corporation, of Des Moines, Iowa, and Kari-Keen Manufacturing Company, of Sioux City, Iowa, which manufacturers openly assumed and conducted the defense of said cases. Said suits came on for hearing in said court before His Honor Judge George P. Hahn, in May, 1935, who entered a decree finding plaintiff's said patent to be valid and infringed by the two devices involved in said suits. Plaintiff having waived an accounting against said dealers who were the nominal de-

fendants of record in said causes, final decrees 13
were entered therein on the 29th day of June, 1935, finding said patent to be valid and defendants' said structures to infringe a number of the claims thereof.

9. Prior to the commencement of this suit and since the entry of the decree in the causes above referred to, defendant herein, Montgomery, Ward & Company, Inc., having had notice of plaintiff's patent through the marking of devices made thereunder by plaintiff and its said licensees and well knowing plaintiff's rights in the premises, in-
fringed and still is infringing the said Letters 14
Patent by selling at its regular and established place of business at Jamaica, within the Eastern District of New York, and elsewhere throughout the United States, truck flares embodying the invention disclosed, described and claimed in said Letters Patent, without plaintiff's license or consent and in violation of plaintiff's rights under said Letters Patent, and is threatening to continue its said acts of infringement, which acts of defendant have the effect of inducing others to infringe said Letters Patent and of depriving plaintiff of profits
to which it is entitled as the owner of said Letters 15
Patent and of causing great and irreparable damage and injury to plaintiff.

10. The devices so sold by defendant in infringement of plaintiff's said Letters Patent have "Mfd. By Anthes Force Oiler Co., Ft. Madison, Ia.," permanently stamped in the metal thereof, and plaintiff is informed and believes and therefore avers that the devices which have been sold and are being sold by defendant in infringement of said Letters Patent were manufactured by said Anthes Force Oiler Company, which company was

16 a former licensee under plaintiff's said Letters Patent, under which license it paid royalties to plaintiff on truck flares of a slightly different construction than those being sold by defendant herein. Said Anthes Force Oiler Company having discontinued the payment of royalties to plaintiff on the plea that its truck flares constructed like those complained of herein do not infringe plaintiff's said Letters Patent, the License to it has been terminated and it is invited to appear and assume the defense of this cause. The truck flares on which said Anthes Force Oiler Company paid
17 royalties to plaintiff under said Letters Patent are illustrated in the advertisement of said company attached hereto and marked "Plaintiff's Exhibit 2" and its truck flares which are being sold by defendant herein are illustrated in its advertisement attached hereto and marked "Plaintiff's Exhibit No. 3." The truck flares charged herein to infringe closely resemble the construction of the Bolser and Kari-Keen truck flares held to infringe as aforesaid, the only difference between the burners thereof being that in the Bolser and Kari-Keen burners held by this court to infringe the air inlet openings
18 were located in the side of the flame guard at points below the flame openings, whereas in the truck flares being sold by defendant and charged herein to infringe the air inlet openings are located in the flange portion of the flame guard which projects from the wick tube and supports the removable portion of the flame guard.

11. Plaintiff is informed and believes and therefore avers that defendant, Montgomery, Ward & Company, Inc., is prepared to and will, unless enjoined by this Honorable Court, continue its said infringement and cause further irreparable dam-

age and injury to plaintiff for which it will have 19
no adequate remedy at law.

WHEREFORE, plaintiff prays:

1. That said Letters Patent No. 1,732,708 may be decreed to be good and valid in law, and that plaintiff's title thereto may be confirmed.

2. That defendant may be decreed to have infringed said Letters Patent by the sale of truck flares manufactured by Anthes Force Oiler Company, of Fort Madison, Iowa, and illustrated in Plaintiff's Exhibit 3 attached hereto.

3. That a preliminary injunction pending this
suit and a perpetual injunction at final hearing 20
may be issued against defendant restraining and enjoining it, its officers, agents, attorneys, servants, workmen, employees, privies and confederates from in any way infringing said Letters Patent or any claim thereof, directly or indirectly, and from contributing to the infringement thereof by others.

4. That defendant may be decreed to account for and pay over to plaintiff all gains and profits which have accrued to defendant and all damages which the plaintiff has suffered by reason of de-
fendant's infringements of said Letters Patent, 21
that this cause may be referred to a Master to take and report to the Court an account of such profits and damages, that the Master may be given all the powers conferred upon masters by law and the rules of equity, and that the Court may increase said damages in its discretion as provided by law.

5. That defendant may be decreed to pay the costs, charges and disbursements of this suit and that plaintiff may have such other and further relief ~~as the circumstances and equity of the case~~ may require.

22 May it please Your Honors to issue a writ of subpoena under the seal of this Honorable Court, directed to said defendant, commanding it at a certain day and under a certain penalty to be and appear before this Honorable Court, then and there to answer this bill of complaint (but not under oath, an answer under oath being expressly waived), and to stand to and abide such further orders, directions and decrees as to Your Honors shall seem meet in the premises.

THE TOLEDO PRESSED STEEL COMPANY,
Plaintiff,
23 By J. E. WITHROW,
President.

DARBY & DARBY,
Solicitors and Counsel for Plaintiff,
OWEN & OWEN,
Nicholas Bldg.,
Toledo, Ohio,
of Counsel.

State of Ohio, County of Lucas, ss.:

On this 15th day of November, 1937, before me personally appeared J. E. Withrow, who being by
24 me first duly sworn, deposes and says that he is President of The Toledo Pressed Steel Company, the plaintiff herein; that he has read the foregoing bill of complaint by him subscribed, and knows the contents thereof, and that the same is true to his own knowledge except as to matters stated to be alleged on information and belief, and as to those matters he believes it to be true.

MARY E. DUKES,
Notary Public, Lucas County, Ohio.

(Notary Seal)

IN THE UNITED STATES DISTRICT COURT 25

EASTERN DISTRICT OF NEW YORK.

THE TOLEDO PRESSED STEEL COMPANY,
A CORPORATION,
Plaintiff,

vs.

MONTGOMERY WARD & CO., INC.,
A CORPORATION,
Defendant.

In Equity
No. E-8417

Answer of Defendant

(Filed Dec. 22, 1937)

Now comes MONTGOMERY WARD & CO., INC., an 26 Illinois corporation, defendant in the above entitled cause, and files this its answer to the bill of complaint heretofore filed herein and shows the following:

1. Answering paragraph numbered "1" of said bill of complaint, defendant states that it is not informed as to the corporate status of the plaintiff and the location of its office and prays strict proof thereof.

2. Answering paragraph numbered "2," this defendant admits that it is a corporation organized and existing under the laws of the State of 27 Illinois, and that it is a citizen of Illinois and maintains a place of business in the City of Jamaica in the Eastern District of New York, but denies that any acts of infringement of said patent were committed by it in the said Eastern District of New York or at any other place.

3. Answering paragraph numbered "3," this defendant admits that this is a suit in equity arising under the patent laws of the United States but denies any act of infringement of said letters patent.

28 4. Answering paragraph numbered "4," this defendant denies that the said Joseph E. Withrow and the said Lyman W. Close, prior to December 26, 1928, were the original, first and joint inventors of a certain new and useful burner, and alleges that all of the claims of said patent were and are void for want of novelty, and are further void as being for aggregations and not for patentable combinations; and this defendant alleges that the invention claimed by said Withrow and said Close in said patent application was well known in the art and public property more than two years prior to
29 December 26, 1928, the pertinent references thereto being more specifically set forth in paragraph "8" hereof.

5. Answering paragraph numbered "5," this defendant denies that said Withrow and said Close were the original, first and joint inventors of the burner described in said application, but admits the making of the application for the letters patent as alleged and admits that letters patent were issued to said plaintiff as alleged in said paragraph numbered "5," but denies that said letters patent have any force or validity, and alleges that
30 all claims therein were and are void for want of novelty and invention, as is more specifically set forth in paragraph "8" hereof, and that said claims are further void as being for aggregations and not for patentable combinations.

6. Answering paragraph numbered "6," this defendant states that it has no knowledge, information or belief as to the expenditures or efforts of the plaintiff in and about introducing the device described in said letters patent into general use, and in and about making it profitable to the plaintiff and useful to the public; this defendant further

states that it has no knowledge, information or be- 31
lief as to the numbers of construction torches and
truck flares sold by the plaintiff or of the granting
of licenses by the plaintiff to other manufacturers
under said letters patent, or as to the payment of
royalties to the licensor as alleged; this defendant
further answering states that it has no knowledge,
information or belief as to whether or not said
plaintiff and its licensees are ready and able to sup-
ply the entire demand of the trade and the public
for torches and flares, and prays strict proof of all
of the allegations of said paragraph numbered
"6." 32

7. Answering paragraph numbered "7," this
defendant states that it has no knowledge, infor-
mation nor belief of the allegations of said para-
graph and prays strict proof thereof.

8. Answering paragraph numbered "8," this
defendant states that it has no knowledge of the
ability of the plaintiff to supply the trade with con-
struction torches, nor of the claimed invasions of
plaintiff's alleged patent claims by other manufac-
turers, nor of the bringing of said suits by plain-
tiff against dealers, nor of the said decree for said
plaintiff in said causes, nor of the issues or claims 33
alleged to be infringed, nor of the structures of the
devices decreed to infringe said letters patent, and
demands strict proof thereof.

Further answering paragraph numbered "8,"
this defendant states that it was not a party to
said suits nor privy thereto; that it took no part
in the defense of said suits, and that it was not in
privity with any defendant thereto, and had no no-
tice or knowledge of the bringing of said suits or
the prosecution thereof nor of the entry of any
decrees therein.

34 Further answering paragraph numbered "8," this defendant states that it is now informed and believes and on such information and belief charges the fact to be that on the trial of said suits the defendants therein did not offer in evidence the pertinent prior art, nor did the court consider or have before it the pertinent prior art bearing on the validity of said letters patent; that from such pertinent prior art it must have appeared to the court that the claims of said patent were and are void for want of novelty; that the pertinent prior art not before the court in said causes now ready to
35 be shown by this defendant is shown in the British patents to

Argand—No. 1425 of July 3, 1784,
Salsbury—No. 16,524 of September 3, 1895,

and in the United States patents to

Rutz—No. 1,101,146 of June 23, 1914,
VanLiew et al.—No. 941,897 of November 30, 1909,
Warren—No. 783,339 of February 21, 1905,

and in the Russian patent to

Malcov—No. 1163 of July 9, 1968,

duly authenticated copies whereof will be produced on the hearing of this cause.

36 This defendant further answering paragraph numbered "8," alleges that the pertinent prior art shows a device somewhat similar to the device disclosed in the aforesaid Letters Patent to Rutz, No. 1,101,146, of June 23, 1914, manufactured by the Milwaukee Gas Specialty Company of Milwaukee, Wisconsin, and sold by that company in large numbers throughout the United States from approximately the year 1914 down to the present date, a specimen of which said device this defendant is ready to produce in open court on the hearing of this cause; and further in view of a device, said to

be of ancient Chinese manufacture, purchased by 37
the General Electric Company from a dealer on or about May 7, 1918, and on public display in its museum at Nela Park, Cleveland, Ohio, for many years thereafter, a photograph of which said device will be produced upon the hearing of this cause; and this defendant further alleges that the claims of said letters patent cover aggregations of well known elements, and are not for patentable combinations, and that all of the elements in the structure described in said letters patent or exemplified by said device were well known in the art
for more than ten years prior to December 26, 38
1928.

And this defendant further avers that the elements in the structure described in said letters patent in suit or exemplified in said device were and are disclosed in the following publications, all of which were made public more than two years prior to December 26, 1928:

Histoire du Luminaire depuis l'epoque Romaine jusqu'a XIXe Siecle by J. R. d'Allemagne, published by Alphonse Picard, Paris, 1891, (John Crerar Library, Chicago, Call No. L 628.9 P
100), particularly the descriptions and illustra- 39
tions on pp. 86-90, 154-5, and 272-3, and Plates 3, 6, 19, 20, and 29.

Das Beleuchtungswesen by Ladislaus von Benesch, published by Anton Schroll & Co., Vienna, 1908 (John Crerar Library, Chicago, Call No. A 628.9 Q 500) and particularly Fig. 113 on Plate 48.

Ancient and Modern Lighthouses by D. P. Heap, published by Ticknor & Co., Boston, 1889 (John Crerar Library, Chicago, Call No. 627.9 O 800) pp. 12-14 and Plates 2 and 3.

40 *Lighthouses and Lightships* by W. H. Davenport Adams, published by Chas. Scribner & Co., New York, 1870 (John Crerar Library, Chicago, Call No. 627.9 N 100) illustration on p. 15.

British Lighthouses by J. Saxby Wryde, published by T. Fisher Unwin, London, 1913 (John Crerar Library, Chicago, Call No. 656.9 R 307) illustration opposite p. 27.

Artificial Light by M. Luckiesh, 1920 (John Crerar Library, Chicago, Call No. 628.9 G 001) illustration opposite p. 56.

Further answering paragraph numbered "8" of
41 said bill of complaint, this defendant states that the alleged invention described in said patent in suit was described in a printed publication more than two years before the filing of the application on said patent in the publication in 1856 at London, England, of the specification of British patent to Ami Argand, No. 1425 of July 3, 1784.

Further answering paragraph numbered "8" this defendant avers that the devices of defendants in said causes were and are substantially different from the complained of devices sold by this defendant; that the said complained of devices sold by
42 this defendant were and are not made in accordance with any of the claims in said patent; that said adjudication of said suits has no bearing on the issues herein by reason of the entirely different structure of the alleged infringing devices from that of the structures before the court in said suits.

Further answering paragraph numbered "8," defendant states that it is informed and believes and on the basis of such information and belief charges the fact to be that said decrees of the District Court of the Northern District of Ohio, Western Division, mentioned in said bill of complaint

and alleged to be an adjudication of the validity of 43
said Withrow and Close patent in suit were entered on the theory by the District Court which entered said decrees that the substance of the invention of said Withrow and Close patent in suit was the protection of the flame at its source; that it was erroneously held by the District Court in said causes that the prior art patents pleaded and relied upon by the defendants in said causes as showing anticipation, namely, United States patents to:

Almond No. 193,796 of August 7, 1877,
Blake No. 453,335 of June 2, 1891,
Kahn No. 1,175,527 of March 14, 1916, 44
Heston No. 270,587 of January 16, 1883,
Hathaway No. 147,496 of February 17, 1874,

did not anticipate the flame guard of said Withrow and Close patent in suit and said District Court held said Withrow and Close patent in suit valid over said prior art as disclosed in said patents.

And further answering paragraph numbered "8" defendant states that it is informed and believes and on the basis of such information and belief charges the fact to be that defendants in said causes appealed said decrees of the District Court
for the Northern District of Ohio, Western Divi- 45
sion, relied upon herein as prior adjudication of said Withrow and Close patent in suit to the Circuit Court of Appeals for the Sixth Circuit; that a hearing on said appeal was had; that on or about December 7, 1937, the said Circuit Court of Appeals for the Sixth Circuit filed an opinion in said causes in which it was held that said Withrow and Close patent in suit was void for want of invention, on the ground that said patents last herein mentioned anticipated the said Withrow and Close patent in suit, and for greater certainty this de-

46 fendant attaches hereto a true copy of said opinion of said United States Circuit Court of Appeals for the Sixth Circuit in said causes as Exhibit "A" and by reference makes the same a part of this answer; and this defendant further states that the said Withrow and Close patent in suit is void by reason of having been anticipated by the following United States patents to

Almond No. 193,796 of August 7, 1877,
Blake No. 453,335 of June 2, 1891,
Kahn No. 1,175,527 of March 14, 1916,
Heston No. 270,587 of January 16, 1883,
47 Hathaway No. 147,496 of February 17, 1874,

which show the invalidity of said patent to Withrow and Close herein sued on.

9. Answering paragraph numbered "9," this defendant denies the allegation ~~of notice~~ of plaintiff's patent ~~and~~ of its alleged said licenses; denies infringing the letters patent within the Eastern District of New York, or at any other place; denies that it sells or has sold any truck flares embodying the inventions disclosed in said letters patent; denies that it has injured plaintiff in any manner; and alleges that the said plaintiff's patent is void for
48 want of novelty and invention; that even if the claims of said patent can be held to be valid for any purpose, the complained of truck flares sold by defendant do not include within their structure any of the claims of said patent.

10. Answering paragraph numbered "10" of said bill of complaint, defendant admits that it has sold truck flares from its said place of business marked "Mfd. by Anthes Force Oiler Co., Ft. Madison, Ia.," and admits that it purchased said truck flares from the said Anthes Force Oiler Company, but states that it has no information or knowledge

by whom said truck flares were manufactured or 49
as to the present or former relationship of said
Anthes Force Oiler Company with plaintiff.

Further answering paragraph numbered "10"
defendant denies that the truck flares charged here-
in to infringe "closely resemble the construction of
Bolser and Kari-Keen truck flares held to in-
fringe," and this defendant states that subsequent
to the filing of the bill of complaint herein the de-
crees relied on by the plaintiff were reversed by a
decision of the Circuit Court of Appeals for the
Sixth Circuit as aforesaid, and this defendant de-
nies that the said truck flares sold by defendant 50
infringe in their structure and operation any of the
claims of plaintiff's said patent.

11. Answering paragraph numbered "11" of
said bill of complaint, defendant denies that it has
damaged or injured or does or will damage or in-
jure plaintiff by the sale of the complained of truck
flares, and denies that plaintiff has shown or stated
any facts which entitle it to the issuance of any in-
junctional or other relief by this court enjoining or
restraining this defendant in any way from selling
the complained of truck flares, and denies that
plaintiff has shown any facts entitling it to any of 51
the relief against this defendant by reason of its
sale of the complained of truck flares.

This defendant further avers that the complained
of truck flares now being sold by it are based in
their structure and theory of operation upon the
luminescent flare, disclosed in the prior art in the
British patent to Henry Salsbury No. 16,524, of
the year 1895, in the Russian patent to Malcov No.
1163 of the year 1868, and in numerous prior pub-
lications showing luminescent flares protected at
the flame source, in combination with a flame guard,

52 as disclosed in United States Letters Patent to A. O. Rutz, No. 1,101,146, issued June 23, 1914, and manufactured and sold by the Milwaukee Gas Specialty Company of Milwaukee, Wisconsin, for more than ten years prior to December 26, 1928, and defendant avers that the aforementioned structures are in the public domain and available for the use of any person who so desires.

WHEREFORE, this defendant denies that the plaintiff is entitled to any of the relief prayed in its bill of complaint and prays that the bill may be dismissed at plaintiff's costs.

53 ....

....

Narrative Statement of the Evidence

Brooklyn, New York, March 8, 1938.

Before:

HONORABLE GROVER M. MOSCOWITZ,
District Judge.

APPEARANCES:

54 DARBY & DARBY, Solicitors for the Plaintiff. SAMUEL E. DARBY, JR., WILBER OWEN, Of Counsel.

ANTHONY WILLIAM DELLER, Solicitor for the Defendant. CARL V. WISNER, JR., Of Counsel.

PLAINTIFF'S CASE

The plaintiff offered in evidence the following:

Deposition of Philip A. Kerwin.

Exhibit 1, Copy of patent in suit, Withrow and Close No. 1,732,708.

Exhibit 2, Photostat of advertisement of Anthes

Force Oiler Company showing Anthes first flare. 55

Exhibit 3, Photostat of advertisement of Anthes Force Oiler Company representing device on which Anthes Company refused to pay royalty.

Exhibit 4, Circular of Toledo truck flare.

Exhibit 5, Direction sheet of plaintiff's truck flare.

Exhibit 6, Certificate of approval of defendant's flare by Electrical Testing Laboratories of New York.

Thereupon, the plaintiff called as a witness JOSEPH E. WITHROW, who, being sworn, testified: 56

Direct Examination by Mr. Owen:

Mr. Withrow: My name is Joseph E. Withrow. I am one of the patentees of the patent in suit. I h[redacted]een connected with the plaintiff since 1926. I a[redacted]w president of the plaintiff company; for the first few months, I think, I had the position of treasurer. When I first became connected with the plaintiff they were manufacturing the open flame McCloskey torch. Later on that same year, we went into production of our own torch, which was 57 an open flame torch.

This torch which you show me is one of the open flame torches manufactured by us at that time.

Mr. Owen: Before going further, Your Honor, I should like to offer in evidence a blueprint produced by the witness Kerwin, in his deposition, as a plaintiff's exhibit.

(The blueprint was received in evidence and marked Plaintiff's Exhibit 7.)

I offer in evidence a photograph which the witness Kerwin identified.

58 (The photograph was received in evidence and marked Plaintiff's Exhibit 8.)

Mr. Owen: I offer a later blueprint produced by the witness Kerwin in his deposition, as a plaintiff's exhibit.

(The blueprint was received in evidence and marked Plaintiff's Exhibit 9.)

Mr. Owen: I now offer this open flame torch which the present witness has just identified.

(The same was received in evidence and marked Plaintiff's Exhibit 10.)

The Witness: This is one of our circulars illus-
59 trating this open flame torch.

Mr. Owen: I offer this circular in evidence.

(The circular was received in evidence and marked Plaintiff's Exhibit 11.)

The Witness: That circular refers to a patent dated January 11, 1927, on a method of fastening the counterweight on the bottom of the torch. That is a patent for an invention of our Mr. Close. He is vice-president of our company and joint patentee with me in the patent in suit.

Mr. Owen: I offer this copy of the patent in evidence.

60 (The copy of patent was received in evidence and marked Plaintiff's Exhibit 12.)

The Witness: The drawing of that patent represents the construction of the open flame torch which has been offered as Plaintiff's Exhibit 10 here. In 1926, we sold 1,121 of those torches. In 1927, we sold 26,630. In 1928, up to July the 15th, we sold 19,689. On or about July the 15th is when we changed the burner to what we called our improved burner. That improved burner is represented by this torch which you now show me.

Mr. Owen: I offer in evidence this torch

with the improved burner just identified by the witness. 61

(The same was received in evidence and marked Plaintiff's Exhibit 13.)

The Witness: The principal purchasers of torches like these two that I have produced were contractors and state highways. Those torches did not give satisfactory service for their uses. We received many letters objecting to them.

Mr. Owen: Now in the record of the Ohio case, Your Honor, the witness read from a large number of those letters.

The Court: Well, both sides seem to agree 62
that they ought to have a cap on. I assume that you thought it was desirable, and an improvement over the old method.

Mr. Wisner: It makes the device more efficacious against strong winds, Your Honor.

The Court: That is what you are trying to prove, isn't it, Mr. Owen?

The Witness: We recommended to our customers that the wick be extended an inch and a half on these open flame torches. That recommendation was made by means of a yellow tag that we fastened to the handle of each torch. 63

Mr. Owen: This tag, Your Honor, reads "Toledo Torch. The normal length of exposed wick is about one and one-half inches. Extend wick further for heavy weather conditions."

I now offer the tag in evidence.

(The tag was received in evidence and marked Plaintiff's Exhibit 14.)

The Witness: After we had produced the improved open flame torch, like Plaintiff's Exhibit 13, we continued to receive objections to its perform-

64 ance. The objections were that they would be extinguished in extremely heavy winds and rains.

The Court: That is not in dispute, is it?

Mr. Wisner: I assume that they got a lot of letters, Your Honor.

The Court: I mean that is not disputed as a practical thing.

Mr. Wisner: Occasionally they went out, yes.

The Witness: We continued our experiments in our efforts to overcome the objections to our open flame torches. We were not satisfied with the
65 burner, and we continued to experiment in an endeavor to improve it. We thought we had made a definite step forward in the matter of the improved burner when we started with Exhibit 13. Using that burner as a base, we started experimenting with structures placed on top of that burner and around the wick. Using that burner, we experimented by placing structures around the wick on the edge of that flat surface. We built those structures and we tried them out on that burner. We tested them comparatively. We would take and build a structure—as a matter of fact, the first
66 structure we built was compared with that one (indicating), and if that structure was better than what we had before, we would discard the poorer one, take the better one as a model and continue experimenting, always using the best as a model. These experiments continued several months. In fact, it was up until the early winter of 1928. Mr. Close worked with me on those experiments.

I cannot produce any of the experimental devices which we made and tested in that time. They were placed in a store room, in a box in the factory at Toledo, among other things which were not in com-

mon use. In July of 1929, we moved from those quarters to a new location and somewhere in the moving and cleaning out, the models disappeared. We searched for them but we have not been able to find them. I can produce sketches or drawings of some of those experimental structures. Mr. Close made the sketches just prior to our case in Toledo in 1935. The old models—we had to make them up from memory. We consulted together and refreshed each other's mind as to what was done and we made those sketches which are remembrances of some of the models. 67

Mr. Owen: I offer these sketches in evidence as one exhibit. 68

(The sketches were received in evidence and marked Plaintiff's Exhibits 15 to 15-I, inclusive.)

The Witness: I have an advertisement showing the construction of the torch, Plaintiff's Exhibit 13.

Mr. Owen: I offer this in evidence.

(The circular was received in evidence and marked Plaintiff's Exhibit 16.)

The Witness: As a result of those experiments, we produced this torch which is now shown me. 69
That is the torch of the patent in suit.

Mr. Owen: I offer that in evidence.

(The same was received in evidence and marked Plaintiff's Exhibit 17.)

The Witness: In making these experiments, to overcome the objections to the open flame torch, there were very definite limitations with reference to fuel and other conditions under which we were working. The fuel had to be kerosene, being a liquid fuel, gasolene was a dangerous thing to place in the positions where these torches were to be

70 used—they were close to traffic and other buildings, and often children played around them.

The burner itself must necessarily be of a simple construction for it to be handled by the ordinary laborer on street jobs. Many of the torches had to be put out at night around constructions, and it would not do to have too fine an adjustment on them. They had to be made to be put out quickly. Both of these conditions called for a wick burner. The burner itself had to be of a rugged and compact nature. The torches were often hit by passing traffic and rolled over, and it was only a rugged
71 structure that would stand up. They had to be of a compact nature, because the weight of the burner was in a location where it was a disadvantage, particularly in the construction torch with the weight in the bottom. The burner had to be counterweighted, and the more weight there was in the burner, the more weight you had to have in the bottom to give it stability. Of course, with the truck torches, it was desirable to have the equilibrium stable too.

Mr. Owen: I offer this paper in evidence.

(The same was received in evidence and
72 marked Plaintiff's Exhibit 18.)

Mr. Owen: This is a drawing of Fig. 3 of the patent in suit with claims 2, 5, 11 and 12 applied.

The Witness: Briefly, those different parts which are represented by numerals and by letters are: A torch body, No. 1, a wick W, a wick tubing 6a, 12a, a supporting and heat receiving flange 5a, a cap 7 with an imperforate top 8, with flame openings 9 and air inlets 10. The heat receiving and wick supporting flange is attached to the wick tube 6a, 12a, and rests upon the receptacle for the cap,

and in this manner supports the wick tube, and the 73
cap is screwed down into that same receptacle onto the flange, and by this means is a heat receiving flange.

After we had placed this patented torch on the market, that is, like Plaintiff's Exhibit 17, there were a great many sold. The sales increased up to the time of the depression.

The Court: Have you got the figures?

The Witness: I have, Your Honor.

The Court: Do you want the figures on the record?

Mr. Owen: Yes, I would like to have that 74
on the record.

The Witness: In the first year, 1929, there were 46,624 torches with Economy burners on the torches sold, and 18,359 burners sold separately, to be placed upon torches that were then in use, that is, the old open flame torches that were then in use. In 1930 there were 53,422 torches sold, 5,524 separate burners. In 1931, there were 52,953 torches sold, and 4,048 separate burners. These were of our manufacture.

At that time the depression was affecting our
business quite severely; our regular business in 75
other fields had practically stopped, and we continued to maintain practically the same sales of this particular item. I received letters from customers indicating whether or not this new torch withstood high winds and rains. Those letters I read from in the Toledo record.

Mr. Owen: Well, if Your Honor will permit, we will just refer you to those letters if you are interested in reading the excerpts.

Mr. Wisner: Of course, I press my objection to the hearsay nature of the statements.

76 The Court: I do not understand that there will be any question about it. You both agree that it is efficient. The defendants say that the product they are making is similar, but they are both efficient. I do not think you have to waste much time about that. I do not suppose either of you would be producing them unless you thought that they were efficient.

The Witness: The old open flame torches such as Plaintiff's Exhibits 10 and 13 were not used as warning signals on the public highways for parked trucks and buses.

77 The Court: You left off what year, was it 1930?

The Witness: 1931, I believe.

The Court: Have you the succeeding years?

The Witness: I have the succeeding years. In 1932, there were 43,197 torches, 3,375 burners. In 1933, there were 76,919 torches, 1,904 burners. In 1934, there were 56,401 torches, 2,151 burners. I did not list the Economy burners any further. The torches, in 1935, 134,831. In 1936, 186,479. In 1937, 129,739, making a total of all torches of 780,565, and Economy burners 35,361.

78 The prices during most of that time, the torch with the Economy burner, listed at $18 per dozen, I think, and now I think they are listed at $16, with 50 and 10 off. And the Economy burners were sold at $4 a dozen with the same discount; at that time I think the discount was 25 per cent, 25 and 5.

The date when the new torch, Exhibit 17, was placed on the market, as I remember, January 7, 1929, was our first invoice. Within a few months after we brought out the Economy burner, the McCloskey Torch Company followed with a burner which was very similar to it.

Q63. And when did the first infringing torches 79
or flares appear on the market?

Mr. Wisner: I object.

The Court: Of course, that is a question I will have to determine.

The Witness: The first infringing torch to appear on the market was the McCloskey torch, the one I was just speaking of. Others appeared particularly in 1933 and 1934. There were a number of a type similar to the Bolser Corporation, and those made by the Kari Keen Manufacturing Company. Those were the two involved in the Toledo
case. We had three licensees at that time, the 80
Anthes Force Oiler Company at Fort Madison, Iowa, the K. D. Lamp Company of Cincinnati, Ohio, and the Do-Ray Lamp Company of Chicago, Illinois.

Economy burner is the name that we gave to our new patented burner. We gave it that name because of the economy in fuel and wick consumption. When we put this burner out on the market we marked it "Patent pending" until the patent was issued, and then marked it with the patent number.

Mr. Owen: Your Honor, we have intro- 81
duced quite a number of drawings showing the experimental devices, and the witness did not go into any detailed explanation. I would like to ask him to do that unless Your Honor would prefer not to have it.

The Court: Is it in that other record?

Mr. Owen: To some extent, yes.

The Court: Is that in question at all?

Mr. Wisner: Whether they made the experiments, I know nothing about it, I assume they did.

82 The Court: Unless it is questioned let us assume that they did.

The Witness: From the experiments which we conducted in 1928 resulting in the production of the Economy burner, we found that some types of burners would work better in some weather conditions and others in different weather conditions. There are some types of burners that would function in the wind, and the same burner that functioned well in the wind might not function so well in calm, comparatively calm weather, on a calm day. Others that would function well in calm
83 weather would not function so well in windy weather. The accumulation of carbon was particularly prevalent on the calmer days and in particularly cold weather.

The introduction of the Economy burner practically drove our open flame torches off the market; for a short time, a year or eighteen months thereafter, there were some sales of the old open flame burner, but then they stopped completely. The open flame burner was not customarily used as a warning signal for parked trucks and buses. There might have been one or two used in an emer-
84 gency that I do not know about, but otherwise they were not. The Economy burner is used for that purpose entirely now. Of course, there are some other burners of that type. I will say our Economy burner and other burners of that type are used exclusively. The only difference in a truck flare and the one used as a construction torch is in the size and shape of the torch body. The torch flare also has what we call a sealing cap on it which the contractor's torch does not. You can extinguish the flame, you can blow on it and blow it out.

Mr. Owen: One of plaintiff's truck flares 85
is offered in evidence as Plaintiff's Exhibit 19.

(Marked Plaintiff's Exhibit 19 in evidence.)

The Witness: The torch is what has customarily come to be known as the contractors' torch, which is the larger size, usually spherical in shape, and sometimes, but not always, having a weighted bottom. A flare is the smaller torch which is used for guarding trucks and buses. The burners in our flares and torches are practically the same, except that in some of the flares we have what we call a sealing cap, and there is a slight difference in the 86
part in which the cap screws.

Three other manufacturers besides those I previously mentioned have taken licenses under the patent in suit. I have some circulars here showing the constructions manufactured by our different licensees under the patent in suit.

Mr. Owen: The witness produces circulars as follows, which I will ask the clerk to mark as exhibits:

Dietz circular, as Exhibit 20.

(Marked Plaintiff's Exhibit 20 in evidence.)

Mr. Owen: Do-Ray Superflare circular, as 87
Exhibit 21.

(Marked Plaintiff's Exhibit 21 in evidence.)

Mr. Owen: That is manufactured by the Do-Ray Lamp Company, Chicago, Illinois, and the Dietz is manufactured by the R. E. Dietz Company, New York.

Another circular of the Storm King Signal Flare, manufactured by Shanklin Manufacturing Company of Springfield, Illinois, as Exhibit 22.

(Marked Plaintiff's Exhibit 22 in evidence.)

Mr. Owen: One of Luck-E-Lite Truck

88 Flare, manufactured by Embury Manufacturing Company of Warsaw, New York.

(Marked Plaintiff's Exhibit 23 in evidence.)

The Witness: I conducted tests for the purpose of determining the fuel consumption of the old open flame Toledo torch and the patented torch. A series of tests were run on April 12, 15, 16, 17, 18, and 19, 1935. The burners tested were the old open flame torch, like Exhibit 10, and a torch using an Economy burner, like Exhibit 19. The summary of results was that the open flame torch averaged 4.95 ounces per hour and the flare 2.06 ounces per
89 hour of fuel. Each of those tests was conducted over approximately eight hours. There were six different tests of eight hours each.

Mr. Owen: I will offer that data sheet in evidence as Plaintiff's Exhibit 24.

(Marked Plaintiff's Exhibit 24 in evidence.)

The Court: Were they on the same size wick?

The Witness: Yes, those were the same size wick, Your Honor.

The Court: And under the same conditions?

The Witness: Yes, Your Honor, except that
90 in the old style torch the wick was extended one and a half inches as prescribed in the directions for its use, and in the Economy burner the wick was extended an eighth of an inch.

The Court: I mean was it done at the same time?

The Witness: Done at the same time, at the same place and under the same conditions.

Mr. Owen: I offer in evidence a sheet containing a drawing of the defendant's flare, with claims 2, 5, 11 and 12 of the patent applied.

(The sheet was received in evidence and marked Plaintiff's Exhibit 25.) 91

Mr. Wisner: Are you seeking to use the witness as an expert, Mr. Owen?

Mr. Owen: No.

The Witness: This drawing shows a torch body "1," a wick "W" and a wick tube "6-A" and "12-A." A wick tube supporting flange "5-A" and a guard consisting of a cap, "7," with an imperforate top "8," with flame openings "9" and a heat receiving and conducting flange "11-A," and the air openings "10" in the heat conducting flange. I have tested torches constructed like this 92
drawing made by the Anthes Force Oiler Company alongside of our own flare, with the Economy burner. They operated substantially the same way. The results are substantially the same. I did not list the results myself. I observed those results, however. This is an Anthes flare like the one that I saw tested.

Mr. Owen: I offer it in evidence as a plaintiff's exhibit.

(The same was received in evidence and marked Plaintiff's Exhibit 26.)

The Witness: In conducting tests of the Econ- 93
omy flare and the Anthes flare, I know that note of the fuel consumption was taken but I was not following the figures on that.

I have an advertisement or circular of the McCloskey open flame torch, and one of the McCloskey closed flame torch. This closed flame torch was brought out within a few months after our Economy burner had been on the market. The first McCloskey open flame torch I saw was in August of 1925. I understand they had been in production since May of that year, but the first ones I saw was

94 in August. The figures of the McCloskey open flame torch show the proper wick extension, as it was practically used:

Mr. Owen: The circular of the open flame torch is offered in evidence as a plaintiff's exhibit.

(The circular was received in evidence and marked Plaintiff's Exhibit 27.)

Mr. Owen: I also offer in evidence the circular of the McCloskey closed flame torch.

(The circular was received in evidence and marked Plaintiff's Exhibit 28.)

95

Cross Examination by Mr. Wisner:

The Witness: My first personal connection with the torch field was in 1926.

The Court: What do you mean by that?

The Witness: I had some money invested in the Toledo Pressed Steel Company since August of 1925. I did not personally participate in the company until 1926.

The torch which has been marked Plaintiff's Exhibit 10 came out in November of 1926. I think the
96 cubical contents of that torch is 7/10ths of a gallon. I do not know what the cubical contents in inches is. I cannot tell you what the inside height is from the bottom to the top space. This structure, Plaintiff's Exhibit 10, was superseded by Exhibit 13. Exhibit 10 was the one I tested in contrast with the improved torch, Exhibit 19. Exhibit 13 was superior in some of its performances, to Exhibit 10. The wick size is three-quarters of an inch.

The Court: Did you test Exhibit 13?

The Witness: No.

The Witness: We used the earlier torch for

comparative purposes, Your Honor. We recom- 97
mended a wick extension of one and a half inches.
We based our recommendation of one inch and a
half wick extension on tests that we made, and ex-
tending the wick to get the best results in severe
weather, and also the fact that when you put the
torch in use in the evening, that before morning
a considerable portion of that wick was burned off,
and during the night there is a possibility of sudden
storms, and it was necessary to at least start with
an inch and a half in order to have sufficient wick
to function during the night. The same kind of
wick is in the new improved torch, Exhibit 19, that 98
was in Exhibit 10.

The Court: Now, what do you mean, the same what? A. The same dimension.

The Court: You do not mean the extension?

Mr. Wisner: No, Your Honor. It is extended up much less.

The Witness: Our theory was, in making the
change from the torch with the wick tube which pro-
trudes from the top to the torch from which no wick
tube protrudes from the top, that a breeze blow-
ing would cool the wick tube and thereby cool the
oil, and also that the wick tube extended down into 99
the body and it could, therefore, conduct heat into
the torch body and help heat the oil in the body
itself. That is if the oil inside the container is
hotter, the flare is more likely to stay lit. Our ex-
perience is that we can keep it hotter by inverting
the wick tube and having the extension down in
rather than up above where the wind can play on
it. We made various experiments in all of which
we maintained the wick tube down inside. We had
already made our experiments with the wick tube
up, and concluded that was not right.

100 XQ130. So when you began putting the hood around the torch, one of the purposes of that hood is to prevent any cool air from reaching the wick tube? A. No.

The Witness: The effect the hood has on the wick tube is that it reflects heat back on the tip of the wick, where the foundation of the flame is, and also is heated and there is a conduction of heat through the cap down through the flange into the wick tube surrounding the wick at the tip. One of our objects in putting this structure on was to keep that wick tube hot.

101 XQ133. And keep the breezes from blowing on it? A. No, we had never thought about the breezes.

XQ134. You abandoned the attempt to prevent the breezes from blowing on it when you turned the wick tubing upside down— A. We did not abandon, we had accomplished it then.

XQ135. That was the way you did it? A. That was the way we did it.

XQ136. Now, the patent says something about a dead air space. That, I assume, is the space which exists immediately below the air ports and between
102 the side of the flame, guarding the wick tube? A. That is around the wick.

XQ137. Around the wick, between the end of the wick and— A. I don't think the patent says dead air space.

XQ138. A layer of quiescent air? A. A layer of quiescent air.

XQ139. And the positioning of these air holes is such that that layer of quiescent air is permitted to exist? A. It really is not quiescent air, it does not go anywhere, it circulates around down in there, it is not really quiescent but it is prevented from moving out of the cap.

XQ140. Now, as I understand you, this particu- 103
lar structure is a compromise—that is, you tried
out various structures, some would work well in
calm weather and some would work well in very
stormy weather. Now, in which particular kind of
weather is this structure supposed to work? A. In
both.

XQ141. And does it work better in calm weather
or better in stormy weather? A. It works a little
better with the wind blowing.

XQ142. Not so well in calm weather? A. No.
If we were to light this torch and set it out—
whether there is any wind or not—some soot would 104
immediately begin to accumulate around the top
burner, both on the inside and outside, and some
around the flame port. There would be an accumu-
lation of those particles of soot—that is true of all
burners. Soot would accumulate around the wick
tube of such a burner as Exhibit 10. The burner
marked Exhibit 17 is the type of construction torch
that we put out first, using this burner, except for
what we call a screw collar. There is no import-
ant difference, however. In these tests that we
made, comparing the performances of the two burn-
ers, we made no test between the large torch Ex- 105
hibit 17, and the large unprotected torch, Exhibit
10. In connection with this torch, Exhibit 17, we
put out some circulars.

XQ149. And in any one of those circulars which
were offered in evidence in the previous case, was
there a statement to the effect that the torch would
burn in windy or rainy weather for 24 hours or
more—I refer to the torch of the type of Exhibit
10? A. That is probably true, I don't know.

XQ150. Some such statement to the effect, "This
large torch will burn through wind and rain for

106 twenty-four hours, if necessary, on one filling," was made in that circular, was it not? A. I presume so.

Those tests which I summarized in Exhibit 24 were made on the roof of our factory building at Toledo in the day time. In those tests the wick of the torch under test, the open flame torch, was an inch and a half high and the wick of the enclosed flame torch was one-eighth inch high. I did not make any observations of the amount of light which the respective torches emitted, the candle power, the light that was given off was suitable for the
107 purpose for which they were intended. There was a wind blowing.

The Court: I suppose—of course I do not know if it can be agreed, but it seems to me with the open wick there would be more light than with the closed, ordinarily I suppose that would be so.

Mr. Wisner: Ordinarily. In some cases there is and in some cases there is not.

The Court: I am not talking where it is blowing too hard, but I am talking about where you light it under ordinary conditions.

108 Mr. Owen: I would like to have the witness answer that inquiry.

The Court: All right, answer it.

The Witness: We weren't interested in the amount of light given off, because the light in either case was sufficient for the purpose for which the torch was intended.

I do not know how fast the air was blowing at any time during the tests. I had not means of measuring it. When I tested comparatively the defendant's flare and the plaintiff's flare, there were no such measurements made on those tests. They

looked to function in the same way, and they with- 109
stood the same kind of wind, and in comparison
with our open flame torch the open flame torch
would go out and both the Toledo torch and the
Anthes torch would remain lighted.

The Court: When you say they went out, was there a wind?

The Witness: Yes, there was wind.

I did not at any time ascertain what the fuel
levels were in the torches which I was testing. I
did not participate in that; my tests were purely
of observation. When I tested Exhibit 10 and Ex-
hibit 19 we filled them up to the top, then weighed 110
them and burned them, and then reweighed them to
find out how much oil had been consumed. Re-
ferring to Exhibit 18, and the numeral 7 on the left
hand of Fig. 3 of that exhibit heat was conducted
down the side of this cap, down the left side, for
example, and down into the ring unnumbered at
the bottom of the cap it went around the side of
the hole. The heat that would go into the flange
11a would only be through the contact that this
particular wick tube has with 5a. There is some
heat conduction in 11a other than what it receives
from 5a, but that would be from heat reflection 111
from the flame onto 11a itself. The path of the
heat reflection I am talking about is a general heat
enclosed within a very small space that is radiated
and reflected back from the walls of that small
space. And it is reflected from the dome 8 down to
this flange 11a. There is some conduction from the
flange 11a to the wick tube. Flange 11a is sup-
ported itself by the flange 5a. I referred to it only
in conjunction with 5a as supporting and heat re-
ceiving flange. The real point of support for the
flange is on 5a alone. They are supporting the
wick tube and the wick.

112 Prior to my investment of money in the Toledo Pressed Steel Company in 1925, I had had no experience in the manufacture of torches.

Redirect Examination by Mr. Owen:

The Witness: The reason we did not test the open flame torch, Exhibit 10, against the closed flame torch, Exhibit 17, for fuel consumption was that the tests were being made to compare the Toledo torches against the infringers in the Toledo case, and the exhibits that were being used or were going
113 to be used were all flares, so we were testing the Toledo flare against the flare of Kari Keen and Bolser, and that is why the flare of the Toledo Company was used rather than the torch. We were testing all three against the old open flame torch for fuel consumption. There was no difference in the construction of the burner in the Economy flare that was used in that test, Exhibit 19, or one like Exhibit 19, and the burner which formed a part of the Economy torch, Exhibit 17. The wick extension in the open flame torch like Exhibit 10, which was tested with the Toledo flare, like Exhibit 19,
114 and the Bolser and Kari Keen flares, had a wick extension the same as that flare or torch was used in practice in the field. In other words, the adjustment of the wick there was exactly the same as we recommended for use in the field. And the adjustment of the wick in the new Exhibit 19 flare was the same as we recommend for use in the field.

The Court: By the way, how high was that wick?

Mr. Owen: They recommend an eighth of an inch in their literature.

The Witness: In the old open flame Toledo torch

the wick consumption would depend on how often 115
it was used. The consumption for over night would vary from one inch to—from three-quarters of an inch to an inch or an inch and a quarter. Those wicks were eighteen inches long. I think those wicks would probably function down to within six or seven inches. There had to be enough wick left to extend to the bottom of the torch. That would be approximately seven or eight inches, so that about ten inches could be burned.

Recross Examination by Mr. Wisner:

116

The Witness: In the defendant's structure the heat would be reflected from all the inside surfaces of the cap 7, and there would be some reflection as well as conduction of the flange 11a onto the wick tube. The flange 11a in the defendant's structure does not support anything; it is supported by the wick tube.

RXQ. Still referring to the drawing, Exhibit 25, and defendant's structure, the wick tube there is so positioned that these cool airs which were so deleterious to the proper burning of the flare can
play upon it, can they not? A. Yes, that is true. 117
You are talking about the old open flame construction?

RXQ. Yes, the air that played onto the protruded wick tube of Exhibit 10, likewise plays upon the wick tube of the defendant's torch, as shown in Exhibit 25? A. That is right.

Redirect Examination by Mr. Owen:

RDQ. Do I understand you to say that the flange 11a does not support anything in defendant's struc-

118 ture? A. It is supported by the wick tube; it does support the cap 7.

RDQ. I do not recall whether I asked you regarding the wick consumption in your Economy torches and flares. A. There is practically none. In fact, we guarantee the wicks for a year, and we never have had to make good on that guarantee.

LYMAN W. CLOSE, called as a witness on behalf of the plaintiff, having been duly sworn, testified as follows:

119 *Direct Examination by Mr. Owen:*

The Witness: I am a resident of Toledo, Ohio, and vice-president of the Toledo Pressed Steel Company.

The Court: Is this witness your expert, Mr. Owen?

Mr. Owen: No, Your Honor.

The Witness: I am one of the inventors of the patent in suit. Prior to the invention of the patent in suit, after studying mechanical engineering at the Armour Institute of Technology, I joined
120 the engineering department of the Griffin Wheel Company in Chicago, and I had considerable experience in plant lay-out work at Denver.

The series of drawings that Mr. Withrow produced marked Plaintiff's Exhibit 15, have typewritten matter on them. I placed it there. It represents an explanation of the construction and function of the device so pictured. I made those sketches myseif.

I am familiar with the tests to which torches and flares are subjected by the different states, in deciding whether they will be accepted for use on the

public highway. I have attended such tests in the State of Iowa, the State of Ohio, and the Electrical Testing Laboratories here in New York. The tests in Iowa consisted of a wind tunnel test to determine whether or not the torches would withstand a specific wind velocity of 35 miles an hour, I believe, I would have to check that—35 or 40 miles an hour, which they require in order to approve torches for use in the State of Iowa. 121

Tests made in Ohio were of a similar nature. They used a wind tunnel to determine the velocity at which the torch would burn consistently. They set a maximum of 35 miles an hour. We tested the torches in that wind tunnel test and demonstrated that they would pass that 35 miles an hour test. In Ohio we tested the open flame Toledo torch, we tested the closed flame Toledo torch and the Toledo flare. The ones with the closed burners passed the tests successfully and those without did not. The Electrical Testing Laboratories here in New York conducted tests on flares of all manufacturers, in order to establish whether or not they would be satisfactory for use in the State of Pennsylvania. The State of Pennsylvania got up a set of specifications, and those specifications were followed in the tests by the Electrical Testing Laboratories, not only on our flares, but on practically all other manufacturers' flares. Plaintiff's Exhibit 6 is a facsimile of the report of the results offered by the Electrical Testing Laboratories on a test made on the Anthes type 8-B flare. 122 123

Q19. What were those tests?

The Court: Are they set forth there?

The Witness: They are, Your Honor.

Q20. Referring to the tests set forth in that document, will you state how those tests were con-

124 ducted in your presence, with the Toledo Economy
flare? A. There were four main tests, one of them
was to subject a set of flares to a vibration test
through a quarter-inch amplitude of 300 vibrations
per minute, with an anvil shock test on each vibra-
tion. This test continued for two hours. I wit-
nessed the test and saw the results of our torch
which passed the necessary requirements. There
was a weatherproof test in which the flares were
lighted and subjected to a standard spray of water
at 1/10th of an inch a minute for 15 minutes, and
then 3/100ths of an inch a minute for 30 minutes
125 and 1/100th of an inch a minute for 45 minutes,
during which time the torch was rotated at the rate
of 4 revolutions a minute. We passed that test.

The water was applied through a standard spray
inclined at an angle of 60 degrees, right on the top
of the torch and the surrounding area.

The third test was the visibility test, the require-
ments being that the torch be visible for 500 feet.
The qualifications were interpreted in terms of
candle power and the candle power of the torch was
measured while being subjected to an air stream
of 5 miles an hour and rotated four times a minute,
126 at the rate of 4 revolutions a minute, and the
amount of candle power demonstrated was at a vis-
ibility of 500 feet. The same requirements that
they be visible at 500 feet was invoked for a veloc-
ity of 40 miles an hour. Of course, there was more
light issued by all torches at 5 miles an hour than
there was at 40 miles an hour, but the candle power
at 40 miles an hour was still sufficient to enable the
laboratory to report that it was visible at 500 feet.
That 40-mile an hour test was continued long
enough to measure the candle power.

The next test was the reliability and light test.

A 40 mile an hour wind was played on the torch, and it was required to stand that wind while being rotated at the rate of 4 revolutions a minute, for 15 minutes, and thereafter a 5 mile an hour wind was directed against the torch and it was rotated at the rate of 4 revolutions a minute and required to burn 11 hours and 45 minutes, or a total of 12 hours in total time. That was the end of the test and our torch passed that test also. Our burner passed all the tests. The flare which was tested was like that of Exhibit 19. 127

New Hampshire, Rhode Island, Nebraska, Louisiana, Arkansas and several other states have re- 128
quirements similar to that of Pennsylvania. Approximately two-thirds of the states now have flare laws, and approximately one-half have laws similar to those of Pennsylvania.

The Court: What are those tests for—that is, where are the flares used?

The Witness: The torches are used for buses and trucks, Your Honor, on the highways.

A typical flare law regulating traffic on highways in the State of Arkansas reads:

"No person shall operate any motor truck on a 129
highway outside of a business or residence district at any time from a half hour after sunset to a half hour before sunrise, unless there shall be carried in such vehicle a sufficient number of flares, not less than three, or electric lanterns or other signals capable of continuously producing three warning lights, each visible from a distance of at least 500 feet, for a period of at least 8 hours, except that a motor vehicle transporting inflammables may carry red reflectors in place of the other signals above mentioned.

130 "Every such flare, lantern, signal, or reflector, shall be of a type approved by the Commission, and it shall publish lists of those devices which it has approved as adequate for the purposes of this section."

The approved specifications are not set up here but our flares, like Plaintiff's Exhibit 19, pass these various requirements.

There is an Interstate Commerce set of specifications which affects vehicles engaged in interstate commerce, and handling materials which are interstate in their aspect. The law of the Interstate
131 Commerce Commission reads as follows:

"On every bus, truck, or truck tractor operating outside the corporate limits of municipalities—"

I might say that this is Section D of No. 3 of the Motor Carrier Safety Regulations, gotten out by the Interstate Commerce Commission, Item B under No. 8, and it reads:

"At least three flares or three red electric lanterns, unless the motor vehicle is operated solely on streets or highways which are artificially lighted at night; each flare (liquid burning pot torch) or red electric lantern shall be capable of being seen and
132 distinguished at a distance of 500 feet under normal atmospheric conditions; each flare (pot torch) shall be capable of burning for not less than 12 hours in 5 miles per hour wind velocity, capable of burning in any air velocities from zero to 40 miles per hour, substantially constructed so as to withstand reasonable shocks without leaking, and shall be carried in a metal rack or box."

And then there is a footnote which reads:

"Flares (pot torches), fusees or any signal produced by a flame, shall not be carried or used as warning signals for motor vehicles used in the

transportation of inflammable liquids in bulk and 133
for motor vehicles transporting compressed inflammable gases; but in lieu of such flares and fusees three red electric lanterns shall be carried and used as warning signals for such vehicles."

Mr. Owen: I understand that the Anthes defendant's torch has passed all of these requirements. That will not be disputed?

Mr. Wisner: As far as I know.

The Witness: We first marketed our Economy torch in January of 1929. I heard Mr. Withrow's testimony regarding certain fuel consumption tests
conducted about 1935. I was present at those tests 134
and can verify them. I have conducted tests of the Toledo and Anthes closed type flares, for the purposes of showing the comparative fuel consumption. The results show that the fuel consumption of the two torches was substantially the same, under the same conditions. Those tests were conducted since February the 1st, 1938, in Toledo on the roof of our factory building, under normal conditions. We also conducted wind velocity tests and fuel consumption tests and luminosity tests. The wind velocity tests were conducted in the wind
tunnel at Polytechnic Institute in Brooklyn, in the 135
wind tunnel of the mechanical engineering laboratory.

Oh, I think that you refer to the wind tunnel test made in Toledo? We have a wind tunnel in Toledo, built to the specifications suggested by a fan manufacturing company, and we were enabled by the use of reduction plates on the back of this tunnel, having a fan of fixed velocity, to vary the speed within certain restricted limits. The torches were tested in front of this wind tunnel at those various speeds, under the same conditions.

136 We found that the highest speed that we could get in that tunnel with that fan velocity was 28 7/10ths miles an hour. Inasmuch as 15 minutes was the limit on the state tests, we arbitrarily determined that if the torch gave evidence of burning continuously for more than 15 minutes, that we would stop the test at 15 minutes. The Anthes and Toledo torches both withstood that air speed and also the lower speeds, of course.

We also tested the old style Toledo torch under the same conditions. At the lower speed of 25 1/10th miles an hour the Toledo old style torch
137 stayed lit for 15 minutes, so in fairness we stopped that test at that same time.

At 26 9/10ths miles an hour speed, it put the Toledo old style torch out in 15 seconds, whereas at a higher speed of 28 miles an hour the old style torch stayed lit for 2 minutes and 30 seconds. This brings out the characteristic of that type of torch, which is its uncertainty. At one time it will perform under one set of conditions, and another time, under the same conditions, it will act differently.

The Court: You are testifying as to what you observed?

138 The Witness: Yes.

In the wind velocity tests on the Toledo and Anthes burners the wicks were extended one-eighth inch. The wick in the Toledo old style burner was extended one and a half inches. We also tested that Detroit three-wick torch, and extended those wicks a quarter of an inch.

I haven't given you the results of the test on the Detroit: At 25.1 miles per hour the Detroit stayed lighted for five minutes. At 26.9 miles per hour it stayed lighted for two minutes. At 28.7 miles per hour it stayed lighted for fifty seconds.

I tested the Toledo open flame torch at the same 139
time. It stayed lighted fifteen minutes at 25.1
miles per hour; for five seconds at 26.9 miles per
hour, and thirty seconds at 28.7 miles per hour.

We made fuel consumption tests running seven
days—the devices are those shown in Plaintiff's
Exhibit 8. Those are the four torches tested in
this test. The test was started on February 1st,
continued on the 2nd, 4th, 5th, 7th, 8th and 9th of
February, 1938, at Toledo. There were various
time periods of four, seven, eight and a half, seven,
seven, nine, 6.75, and 6.77 hours that were covered
by those tests, and the averages were taken of the 140
total fuel consumed by each of those four torches.
That was reduced to the rate of ounces per hour,
and an average of those seven tests is as follows:

The Toledo Economy burner burned at the rate
of 1.637 ounces per hour.

The Anth[illegible]s burner burned at the rate of 1.633
ounces per hour.

The Toledo old style open flame torch burned at
the rate of 4.634 ounces per hour.

The Detroit Street Railway torch burned at the
rate of 4.238 ounces per hour.

The Court: In the case of the old style 141
torch, the wick was how far out?

The Witness: The old open flame torch, in
that case the wick was extended a length of
one and a half inches, and on the Detroit, one-
quarter of an inch.

The Court: Is that usually the correct
amount?

The Witness: That is the correct amount.

The Court: Not less.

Mr. Wisner: May I point out to Your
Honor that the Detroit Street Railway man

142 testified that they used one-half inch extension.

The Court: He was just saying what his experience was.

The Witness: An inch and a half is right on our torch on an average weather condition. You are apt to meet extreme conditions that you do not know ahead of time. In those tests we had a wick extension of a quarter of an inch, on each of the three wicks of the Detroit torch. That is torch A on this Exhibit 8.

Q59. How did you arrive at that wick extension?

143 The Court: It all comes down to this: Counsel for the defendant concedes, and properly so, it seems to me, that the longer the wick the more oil will be consumed. Now, the difference between you is whether or not the wick should be extended an inch and a half or less.

Mr. Owen: Yes. I will ask the witness what his experience has been.

The Court: Because it is common sense to realize that the longer the wicks are the more oil will be consumed.

The Witness: My experience in determining the
144 length of wick exposure which is desirable for all kinds of uses of this open flame construction torch such as shown at B in Exhibit 8 was as follows: when we started out with that torch we wanted to have the wick extended as little as possible; common sense dictated that. Complaints began to come in because torches were going out. Naturally we wanted to strengthen the flame, and we decided that a longer wick exposure would assist in solving that difficulty. And after considerable experience in settling complaints, making tests of our own, we found that an inch and a half was about the shortest

length you could bank on over night, because we 145
did not know ahead of time what kind of conditions
were going to be met. As we extended the wick the
fuel consumption rose, I would not say it was di-
rectly proportional to the exposure of the wick,
because I cannot say that definitely.

Mr. Withrow's attention was called to some
statement that plaintiff had made in connection
with those open flame burners, that one of them
had burned for twenty-four hours, that might have
been one with a short wick extension or a tighter
wick. There are so many variables that enter into
the consumption and operation and performance 146
of a test, it might have been a tighter wick that
didn't feed oil as freely. It would be entirely pos-
sible for one of these open flame Toledo torches to
burn for twenty-four hours under proper weather
conditions and with the proper wick extension.

I have a memorandum of the fuel consumption
tests of the Toledo and Anthes flares, to which I
have just testified.

Mr. Owen: I offer them in evidence as
Plaintiff's Exhibit 29.

(Marked Plaintiff's Exhibit 29 in evidence.)

The Witness: By experiment we found that one- 147
quarter of an inch extension on each of the three
wicks in the Detroit torch would give approxi-
mately the same volume of flame given off by the
one and a half inch wick extension on the Toledo
old style torch. On the Toledo flare and Anthes
flare used in those tests we had a wick extension
of one-eighth of an inch. I have here a written re-
port on the wind velocity tests of the same four
devices shown in Plaintiff's Exhibit 8. We didn't
measure that ourselves, but I witnessed it meas-
ured by a Taylor anemometer produced by the De-

148 Vilbiss Company, whose specifications were followed in building the tunnel.

Mr. Owen: The wind velocity test data produced by the witness is offered in evidence as Plaintiff's Exhibit 30.

(Marked Plaintiff's Exhibit 30 in evidence.)

The Witness: I have here a photograph of the wind apparatus which we used in those tests.

Mr. Owen: This photograph produced by the witness is offered in evidence as Plaintiff's Exhibit 31.

(Marked Plaintiff's Exhibit 31 in evidence.)

149 The Witness: This photograph shows the wind tunnel in our plant at Toledo which I have already described.

Cross Examination by Mr. Wisner:

The Witness: I do not have a copy of Plaintiff's Exhibit 31, the photograph of this wind tunnel, but I am familiar with it. The photograph purports to show a flare on a platform at the end of the wind tunnel.

Now, in these state tests about which I testified,
150 the practice is to center the flame of the flare upon the center of the wind tunnel. That was not done in this case. I mentioned that I made some measurements of the volume of the flame produced by the Detroit Street Railway torch, and the unprotected Toledo torch, with an inch and a half wick extension. This measurement was purely visual. We compared them visually as to size. We did not use a photoelectric cell to take it accurately. I do not know what the candle power was that was produced by the one in comparison with the candle power produced by the other. We assumed they

were the same size as you would view them, that is 151
all. When we were determining to our own satisfaction that an inch and a half wick was the most satisfactory extension, the test was simply that we pulled it out—we started with a lower extension, and as they were extinguished under average weather conditions, we raised them up until we found that an inch and a half tested the best under average conditions on several occasions, and concluded to recommend that length. An average weather condition is a condition that you would meet with from a repetition of tests over a num-
ber of nights, from a calm night to a windy night, 152
or a rainy night, so that you get all different conditions included. And it wasn't measured in miles per hour, and I would not know how to evaluate it in miles per hour. We took wind and rain into account. I could not say how much rain in inches per hour because we did not take any figures on that.

I wouldn't say the torch would work better under certain conditions if the wick were not out an inch and a half; it probably would consume less fuel. Of course, if it was not extended very far it would
produce less light than if it was extended extremely 153
far. The difference between an inch and a half and one inch, for instance, might be very slight to the normal eye, but possibly it would show considerable difference in candle power. When this is extended an inch and a half you have a great big bonfire when you start, but it settles itself down normally to a point where it isn't terribly big. That is what burns up the wick. Of course, the wind burns the wick, fanning the flame off onto one side, and bringing the glowing embers of the wick into a charred condition is what consumes the wick. As

154 long as there is oil on the wick and the oil is being volatilized, the wick is not being consumed. It is only the vapor of the oil that is being consumed then. But when the vapors are blown to the opposite side of the wick, leaving the extremely hot ends of the wick in the fire, at the firing point of the wick, you might say, they are charred and are consumed by their own combustion.

A great many states do not have any tests at all, for example, the State of New York has no tests or requirements for flares. They have a flare law, but no specifications for approval.

155 XQ96. The only states maintaining state laboratories are Iowa, Nebraska and Minnesota, are they not? A. Well, they use the university, the Ohio State University, in Ohio, because I have witnessed tests down there, passed those tests. And the tests are conducted by the Highway Department in the mechanical engineering laboratory of Ohio State University.

These states that have a law similar to the one, for instance, in Pennsylvania, are more difficult to qualify a torch than in other states because of the rigid requirements in the specifications, as noted
156 in my testimony. Nebraska is one of those states, because it has practically the same law, the same specifications.

I did not testify that I made observations of visibility at 500 feet on the roof of our building at Toledo. I testified to no visibility observation. I did not testify that we made any attempt to test visibility.

The fuel consumption test was made up on the top of our building. It was on top of a building that has a factory under it, one-story factory. I imagine the roof is about, at this particular point,

50 feet above the ground. The torch was placed on 157
a platform which was elevated above the roof about
6 feet, so that the torches were away from any protecting wall surfaces or anything of a similar nature. They were burned during the day time when we could observe whether they would stay lit. We would light them in the early morning and extinguish them at night.

The torch is intended to be used on the road. That is, at an elevation of perhaps six or seven inches from the ground with the bottom of the torch resting on the surface of the pavement.

With reference to the wind velocity test disclosed 158
in Exhibit 30, that motor which we used was not a variable speed motor. That is, we put a plate with an orifice of varying size over the end of the wind tunnel. We measured the wind velocity by a Taylor anemometer in the position of the torch.

XQ121. That is, you took the velocity reading at one time, and then subjected the torch to what you considered to be that velocity, and then took that other reading, is that it? A. That is true.

XQ122. So there was no continuous reading of velocity while the torch was being burned? A.
No; the motor had a constant speed. I was present 159
continuously during these wind velocity tests.

With reference to this letter marked Plaintiff's Exhibit 27 in the preceding case, tried in Toledo, Ohio, I was present at some of the tests described in that letter. On page 2, the third paragraph, he states: "For the wind test a tunnel was prepared"— He is not there discussing any test in particular, he was discussing the method of making these tests. I saw him follow this method before the date of the letter. That was probably a little less than two years before that date.

160 Mr. Wisner: One of the last things we had before us yesterday on adjournment was the question of this Exhibit 27 in the Bolser case, which was a letter written by one of the testing engineers for the State of Iowa which the plaintiff was seeking to have put in evidence.

The Court: I will permit anything as to the tests, but so far as conclusions are concerned, I will not be bound by any conclusions of anybody else.

Mr. Owen: May I offer the letter with that understanding?

161 The Court: Yes.

Mr. Owen: Letter from the State of Iowa Commission, State of Iowa, to the plaintiff, is offered—

The Court: This is offered in lieu of testimony.

Mr. Owen: It was marked as Exhibit 27 in the Toledo case. Possibly I had better offer a copy of it without any markings on it.

(Marked Plaintiff's Exhibit 32 in evidence.)

The Witness: I identified certain photostatic drawings marked here in Exhibit 15 as having been
162 made by me. They were made long after the devices which they seek to explain or disclose were constructed. They were made from memory. And the devices which they portray are no longer in existence, as far as I know. There may have been some slight differences or variations between the actual devices and these dr[illegible]

I think you will find on that tag that was offered as one of our exhibits there is an instruction not to spread the wick. In connection with these tests which I have testified about, in so far as I know the wicks were used as instructed on our tag. That

is, when we tested them we did not have them 163
splayed, but it was all in one tightly bound compact unit, the wick was just cut off as it was made and used in that manner.

Redirect Examination by Mr. Owen:

The Witness: I was asked on cross examination whether the sketches, Plaintiff's Exhibit 15, accurately represent the devices which we made and tested. They do not differ in any substantial regard from the devices which were actually made and tested. They truly represent the construction 164
of those devices.

Recross Examination by Mr. Wisner:

RXQ140. You testified on your direct examination with reference to the statement made in one of the circulars covering the Toledo torch which I now identify as Defendant's Exhibit A in the preceding case, appearing on pages 217 and 218 of the record in that case, with reference to this statement as follows: "It will burn through wind and rain for more than 24 hours, if necessary, on one 165
filling." That you state might have been with a short wick? A. Well, I do not think it is really necessary to qualify that statement, because we have had that performance repeatedly and variations that would occur in normal construction of a torch might affect it one way or another, but I believe that to be a true statement of the ability of the average torch.

Mr. Owen: I have handed up to Your Honor a copy of Judge Hahn's opinion, and inasmuch as that opinion discusses the ques-

166 tion of infringemennt, I wish to offer a drawing of the Bolser flare which was introduced by the defendant in the Toledo case. This I will ask be marked as a plaintiff's exhibit.

(The drawing was received in evidence and marked Plaintiff's Exhibit 33.)

Mr. Owen: I also offer in evidence a similar drawing of the Kari-Keen flare in the Toledo case.

(The drawing was received in evidence and marked Plaintiff's Exhibit 34.)

Mr. Owen: I now offer a stipulation en-
167 tered into by counsel for the respective parties with reference to the use of soft copies. One of the flares sold by the defendant in this case is shown by the blueprint attached to the stipulation.

(The stipulation and blueprint were received in evidence and marked as one exhibit, Plaintiff's Exhibit 35.)

Mr. Owen: I also offer in evidence as a plaintiff's exhibit stipulation relating to the incorporation of the plaintiff company and other allegations in the bill of complaint which
168 were denied or not admitted by the answer, and also having attached a copy of the license agreement between the plaintiff and the Anthes Force Oiler Company.

(The stipulation was received in evidence and marked Plaintiff's Exhibit 36.)

DEPOSITION OF PHILIP A. KERWIN 169
TAKEN MARCH 3, 1938, AT
TOLEDO, OHIO

PHILIP A. KERWIN, having been first duly sworn, testified as follows:

Direct Examination by Mr. Owen:

The Witness: My name is Philip A. Kerwin; I
am 52 years of age; superintendent of Way and
Structures Department of Street Railways, City of
Detroit, Michigan. I was superintendent for the De- 170
partment of Street Railways since the city bought
the Detroit United Railways, May 15, 1922; pre-
vious to that I was assistant superintendent of the
D. U. R. Lines. I was connected with the D. U.
R. Lines in that capacity for about five years be-
fore 1922—about 1917. Previous to that I was
chief clerk of the Way and Structures Division,
from May 1, 1907.

When I first became connected with the Detroit
United Railways, they were using red lanterns.
They set them around the excavation in the street.
They would be broken, stolen, and the losses were 171
quite substantial from those causes, and they still
are. We still supplement them—we use both—
supplement the torches with the lanterns. We now
use mostly a castiron torch, kerosene torch, with a
three-wick cap, open flame. The castiron torch was
first used about 1913, through 1913 and '14, and
the record drawing showing the type of torch is
dated March 1, 1915. I am referring to a blue-
print from the old Detroit United Railway's rec-
ords. I believe it has a number on it—Drawing
No. 101-17.

172 I made this blueprint off the tracing which was
turned over to the Department of Street Railways
with the records of the Detroit United Railways.
I was first familiar with that tracing, or with blue-
prints made from it in 1915. This device, marked
Plaintiff's Exhibit 7, which is shown in this blue-
print, was the idea of John Kerwin, who was the
superintendent of Way and Structures at that time.
He is my uncle. I did not bring the tracing with
me. The device shown in Plaintiff's Exhibit 7 is
a container about 8⅛ inches high, about 5¾ inches
wide, fitted with a cap, a threaded cap, drilled to
173 take three wicks. That container shown in the left-
hand figure is cast iron. The figure in the upper
central part of the blueprint is a plan view of the
circumference of the torch. The two figures on the
right-hand of the print are sections—two sections,
one a cross-section, and the other a plan view of
the cap that is drilled to hold the wicks, which
threads down into the casting. The three wick
holders are shown in the upper right-hand view.
They are drilled vertically in the cap, and each one
holds a wick. In practice, the average wick exten-
sion used in that torch is approximately a half an
174 inch above the top of the cap. About a month ago
I gave one of those torches to Mr. Close of the
plaintiff company.

In Plaintiff's Exhibit 8 I recognize the device marked "A" as the one that I gave Mr. Close. It was one carried over from the old D. U. R. days, an old torch that I got out of the store room for him. It was in such condition that it could be used; it is pretty well scarred up; one of the ears knocked off of it, and it is simply a relic; that type is not used now any more. We started to use that type about 1913, and we used them for the first few years

under the city ownership—I would say up to about 175
1924 or '25.

While that type of torch was in use, we had trouble from its being extinguished by drenching rains, although a high wind would extinguish it also. We took precautions against having these torches blown out or rained out by experimenting while still in the D. U. R. ownership—that would be before 1922—with a small umbrella covering that was made in two ways, trying to find the way that would be best; one way was supporting it on three legs rising between the wick openings; another way
was just a center pin raising up from the center 176
of the cap to carry the umbrella. We used them for probably a couple of years. Our difficulty was with the center pin, that in throwing the container around, it would be bent and sometimes broken, and with both the center pin and the one supported with three legs, we still had trouble with the torches being extinguished in a drenching rain or in a very high wind, and so we concluded that those happenings were so infrequent that we could just as well get along without the cap, and we discontinued the use.

The blueprint of that umbrella made by the De- 177
partment of Street Railways of the city of Detroit in 1926, March 24, 1926, shows the torch itself cut down to a 4¾-inch height, and it also shows the umbrella supported on the center pin. That, however, while shown on the drawing, we have not used in the Department of Street Railways ownership since 1922, although it is shown in this record drawing of 1926. We have never used any type of umbrella since experimental days of D. U. R. before 1922. The experimenting was done upon this type and the three-legged type, and although

178 this is shown on the city drawing, it was never used since the city used the lines. These blueprints marked Plaintiff's Exhibits 8 and 9 are the city drawings.

To the best of my recollection, we experimented with this umbrella over the three wicks for a period of a couple of years and then discarded it as giving just as much trouble and having just as many flames go out as if we hadn't carried it at all. It did not remedy the defect that we were trying to overcome. We have trouble today from these torches being blown out or rained out. For the
179 protection of the public under those conditions, all excavations are protected at night time, in addition to the mechanical protection of torches, by watchman. He has many duties, takes care of the tools, watches them that nobody steals them, and makes the rounds regularly to see that the torches are burning, and if they are extinguished by rain or high wind, it is his duty to relight the torches.

The theory on which three wicks were used instead of one was that if one wick were to become short and should go out, you would still have the protection of the other two; and if two went out,
180 you would still have one. If a rain or high wind puts out the flame, it is apt to put all of them out. The idea is, sometimes the workmen are careless, and they might have a short wick in there that might burn out, which would still leave a light if the other wicks were long. If in a wind or rain one or two of the flames were extinguished, they would be relighted if one remained lighted.

I know of the closed torch like that put out by the plaintiff in this case, The Toledo Pressed Steel Company. It is a good many years ago that I first saw that torch; that is, I don't know whether

it had the cap on it when it first came out. I 181
couldn't say exactly how long I have known of the cap; I would say it is probably eight or ten years. Those have never been used by the Detroit United Street Railways because we have a torch designed to take care of our peculiar circumstances. The torch has got to be low enough to set down in the depth of the brick pavement. We find that where we are working in between the rails of the track, the side—the street alongside, the driveways on the street alongside of the excavation are passable; people, however, will follow a street car down the
track, and if the car is traveling along at fifteen, 182
twenty miles an hour, and they are following right behind it, they go into the excavation unless it is protected between the rails, and so for that reason we dig up the brick, a couple of rows of brick across the track, and set these torches down in the space from which the brick has been removed, which brings the flame just about level, or just above the level of the brick pavement, in which case the cars pass over without knocking over the torches. That is the torch which is shown on the blueprint last produced, Exhibit 9.

183

Cross Examination by Mr. Wisner:

The Witness: In 1913 I was chief clerk of the Way and Structures Division with the Detroit United Railways. I had charge of the records, of directions issued through the superintendent to the foremen on the streets, supervision over the stock, supplies and orders that were placed. When I became assistant superintendent, my duties included more supervision of the actual jobs out on the street. That is, I went out occasionally observing

184 the jobs as they were working on them. I have had no mechanical engineering experience.

Kerosene is the fuel used in the type of torch exemplified by the blueprint, Plaintiff's Exhibit 7. I would say the diameters of the three wicks that were used in the torch would be about a half inch. I think the print would show that. Looking at the print now, I would say nearer to a quarter of an inch; my guess was wrong. In the outermost circle in the drawing in the upper right-hand corner of Exhibit 7 there is one shown to have a diameter of ¾ inch, and then there is one shown to have a
185 diameter of ⅝ inch, and then there is one showing a diameter of 11/32 inch. The smaller diameter would be the hole in which the wick fits, that is, the wicks were approximately 11/32 inch in diameter.

I never made any observations of the amount of wind or rain in inches per hour which one of these torches would withstand. They would, however, withstand a considerable degree of wind and an ordinary rain. It was only a drenching rain—a very heavy rain, that would extinguish a torch. I don't suppose we would have trouble with rain or wind putting out a torch more than once a month.

186 We use both the red lantern and the torch in conjunction today. Referring again to Plaintiff's Exhibit 9, and to the drawing with the umbrella mounted over the wicks, I have produced no drawing where a three-legged tripod was used to support the umbrella. The three legs positioned on the structure would be outside of the wick holes and spaced in between them; that is the way I remember it. This type of a cap over the wick was tested in rains; left them out in service. I have no means of stating what amount in inches of rain per hour they were subjected to. These particular

tests, about which I have just testified, were made, 187
I would say, around 1920 by the various foremen in charge of jobs. I saw the wicks in use, or the umbrellas in use, repeatedly. I was never present at any time in which one of these structures with the umbrella covering was extinguished in a rain. That always happened through the night time when the torches were out for protection, and we would get the report from the foreman the next morning. Those were the only reasons for which the torches would have gone out that I remember being reported. As far as anyone actually knows, some-
body may have blown them out for a prank, that 188
could have happened, but doesn't sound plausible, I don't think. However, anyone could put one out.

I did not make any experiments with the extent of wick extension which was most efficacious. That was left pretty much to the man on the job, but my observation was that it was about a half inch of wick that would produce a good flame. I do not recall any experiments with reference to the distance between the top of the wick and the bottom surface of the umbrella. I think that originally those umbrellas stood up higher than the inch that
is shown in this last drawing—probably two inches 189
or maybe three inches. But that is a matter of recollection. The diameter of the threaded bolt which supported the umbrella was 3/8 inch. I don't recall the name of the person who made this drawing, but the approval, I know that signature and name. That is B. B. Moore, office engineer, Detroit Street Railways. He is living.

The watchman's instructions were to keep those torches filled. They are cleaned and filled every day by the day watchman preparatory for the night work, the same as the lanterns are taken care of.

190 I wouldn't say offhand how much oil they hold. I would have to guess at it; it could be estimated from the measurements. They were filled by unscrewing the cap. That was unscrewed and the wicks adjusted and the oil was put in every day, after the night was over, and the night watchman picked up the torches and brought them in; then the day watchman's job was to clean them and fill them and get them ready for the next night again. Those experiments were always made at night, that is when the torches are burned, at night time. They were made all year 'round; we have work going on
191 winter and summer. Exhibit 9 is a complete assembly except that the wicks are not shown. I am not aware of any element of the structure which is omitted from this drawing.

I couldn't say what firm we buy our wicking from. Prior to 1913 we used the red lantern exclusively as a warning signal. I am not aware of any use of torches similar to the one that is shown in those two blueprints prior to 1914. I know that open flame torches are being used at the present time; whether they have a plurality of wicks or not, I don't know.

192 I never met Mr. Owen before coming in here today. Mr. Close called at my office about a month ago. He is the only man I have talked to about the case.

These structures are made by whoever happens to be the successful bidder on the castings. It may be a Detroit foundry, or it may be a Bay City foundry; we advertise them for open bids. We use these torches otherwise than in between the rails of the streets, we set them around the excavations on the pavement. The same type of low torch. We use only the low torch now; we have no

more of the high torches in use. The one that I gave Mr. Close is one of the old high torches. I was not able to observe from our testing of these torches whether there was any difference in performance when the umbrella was placed on the bolt centered between the three wicks, and when the umbrella was supported by the three-legged affair outside of the wick. My recollection is that with either type, the high wind or rain would extinguish them, so we discontinued using both types. Most of my information about their performance would be reported by the foreman in charge of the night work. 193

194

Redirect Examination by Mr. Owen:

The Witness: It was the duty of the foreman to report to me as superintendent. They report to me practically every day. These reports came to me in the regular course of their work. They were sometimes verbal, sometimes written. This umbrella was used on the high torch—that is where it was tried out. Referring to Exhibit 9, it is 3⅛ inch diameter of umbrella by ⅛ inch thick, and it was made out, as I remember it—just cut out of 195
ordinary ⅛-inch steel plate and drilled to fit the carriage bolt; held in place to fit the head of bolt. I will indicate on Exhibit 9 by small circles where the three studs were located which were used to support the umbrella. Approximately, as nearly as I can remember, it would be in a position between the wick openings and somewhat outside the circle of the wick openings. I have indicated those locations by an X mark with red pencil. I do not remember what size bolts were used for those three supports.

196 *Recross Examination by Mr. Wisner:*

The Witness: A torch such as shown in the lower left-hand corner of Plaintiff's Exhibit 9 was made. We experimented with the umbrella and we used the torch, but when we used the umbrella on the torch it was the deeper torch, it was the 8-inch deep torch. But the method, umbrella method, and appliance, was the same as we experimented with. We have not in this low torch used the umbrella, although the idea was carried over from the original, as shown on the drawing.
197 I couldn't say offhand how many of such structures with the umbrella were made, but there would be quite a few, because the ordinary opening probably takes twenty torches to guard it, and we have many openings, depending on the various times of the year—I would guess that probably one hundred to two hundred probably were fitted that way. These written reports I referred to were preserved in the file of the superintendent's office. They went with the D. U. R. Those records all disappeared with the going out of business. All of this was prior to the taking over of the railroad
198 by the city of Detroit. We were experimenting with the umbrella about 1920; it was previous to the time the city took the D. U. R. Lines, which was May, 1922. I do not remember any of the reports disclosing what time of night the torches were extinguished. I don't remember that now. It might have been at any time during the night. The torches were ordinarily lit about dusk; that would depend on the season of the year.

(Certificate of notary omitted.)

DEFENDANT'S CASE 199

Mr. Wisner: I handed up to Your Honor a certified copy of the opinion of the Circuit Court of Appeals.

(The opinion was received in evidence and marked Defendant's Exhibit A.)

Mr. Wisner: I now offer in evidence as a defendant's exhibit a photostat comprising enlarged drawings taken from the patent specifications of the patent in suit, of the Rutz Patent No. 1,101,146, relied upon by the plain-
tiff; of the Russian patent to Malcov of the 200
year 1868, No. 1163, and a figure of the defendant's burner.

(The drawing was received in evidence and marked Defendant's Exhibit B.)

Mr. Wisner: I offer in evidence as a defendant's exhibit a volume of patents.

(Marked Defendant's Exhibit C in evidence.)

The Court: Which of these are anticipatory patents?

Mr. Wisner: Some of them are state of the
art patents. The anticipation patents which 201
we cite are very few, about four or five.

The Court: Argand, Salsbury, Rutz, Van Liew, Warren, Malcov, Almond, Blake, Kahn, Heston and Hathaway, those are the patents?

Mr. Wisner: That we rely on as anticipation.

The Court: What did you say your best reference was yesterday?

Mr. Wisner: There are three, Rutz I consider one of the best references, Malcov, the Russian patent of 1868, No. 1163, and Argand,

202 of July 3, 1784, No. 1425. It is the Argand specification, there are no drawings.

Mr. Wisner: I offer in evidence as Defendant's Exhibit D, a bound volume of the photostatic reproductions of the pages relied upon on page 5 of the answer in anticipation as publications.

(Marked Defendant's Exhibit D in evidence.)

I offer in evidence as Defendant's Exhibit E a stipulation with reference to the testimony of Oscar J. Leins, of Milwaukee, Wis-
203 consin. Notice of the taking of this deposition was served on January 12, 1938.

(Marked Defendant's Exhibit E, in evidence.)

Mr. Wisner: In connection with the deposition, I offer in evidence as a defendant's exhibit the curves for all of the graphs curved by Professor Croft, disclosing the nature of the performance of these various devices in the tests which he made.

(The curves were received in evidence and marked Defendant's Exhibit F.)

204 Mr. Wisner: I now offer in evidence stipulation with reference to the tests taken after the taking of the deposition, and stipulation with reference to the test experiences which has been entered into between plaintiff and and defendant on March 3, 1938.

(Marked Defendant's Exhibit G in evidence.)

Mr. Wisner: I offer the deposition of H. O. Croft, taken January 18th and filed January 28th.

(Marked Defendant's Exhibit H in evidence.)

MATTHEW LUCKIESH, called as a witness on behalf of the defendant, having been duly sworn, testified as follows: 205

Direct Examination by Mr. Wisner:

Q1. State your name and residence, Doctor. A. Matthew Luckiesh, Cleveland, Ohio.

Q2. What is your occupation? A. I am the Director of the Lighting Research Laboratory of the General Electric Company at Nela Park, Cleveland.

Q3. What has been your educational preparation with reference to this work? A. I have a number of degrees. 206

Q4. That is, from universities? A. Yes.

Q5. Has your work anything to do with light and lighting equipment? A. Entirely.

Q6. Have you written any books with reference to such matters? A. Quite a few.

Q7. Do the names of any of them readily occur to you? A. Artificial Lighting, Its Influence on Civilization, Lighting Art, Lighting Fixtures, and Lighting Effects, Science of Seeing, and so forth.

Q8. Have you had anything to do with the historical aspects of lighting? A. I have always been interested in it, and of course, we have had to know the background. 207

Q9. In your preparation for testifying in this case did you first familiarize yourself with the devices involved? A. Yes, sir.

Q10. Within what classification, roughly, in the lighting art, would you place the product of the Toledo Pressed Steel Company, Plaintiff's Exhibit 19? A. A rather primitive light source, similar to those of centuries ago.

208 Q11. It might be classed as a chimneyless hydrocarbon burner, might it not? A. Yes.

Q12. What sort of fuel does it use? A. Kerosene, signal oil, and similar things.

Q13. What are the means used for transferring the oil from the reservoir to the level of the flame? A. The common wick.

Q14. As the oil reaches the top of that wick through capillarity, through what process does it pass before it gets into the condition of lumination? A. It is vaporized by the heat of the flame and burns as a vapor.

209 Q15. What is the principal source of heat which vaporizes it? A. The flame.

Q16. And would that be true whether or not there were a protective housing for the wick? A. Yes.

Q17. Can you explain very briefly the reasons why a flame of this type gives light, that is, a hydrocarbon light? A. In general there are carbon particles in the flame that are heated to incandescence, and they give off light.

Q18. What happens to these carbon particles after they reach incandescence? A. They may be
210 partially burned, some of them may not be burned, and they can go off as soot or smoke and settle on nearby surfaces.

Q19. Directing your attention now to Fig. 1 of the drawing on the easel, that is the Toledo device, will you point out on what surfaces the soot of which you have just spoken would be deposited? A. On this device the natural place would be inside of that top and around the air ports chiefly. Of course, I cannot conceive of any part of that surface, interior surface, not receiving soot eventually.

Q20. Ordinarily what effect does the burning 211
process have on the wick? A. When the wick is not too generous it has practically no effect, as we know from our experience, of course, with millions of kerosene lamps and similar devices.

Q21. Will you explain what you mean by "generous"? A. When they pull the wick out an inch and a half you have got practically a bonfire of cotton fibre.

Q22. Will you direct your attention to Plaintiff's Exhibit 13? A. Yes. If you want to burn up some waste of cotton, that is the way you would do it. Whereas, if you want to conserve the cotton, 212
you would saturate it with oil and keep it saturated and burn the oil rather than the cotton.

Q23. What are the concepts which enter into any structure adapted to burn a hydrocarbon fuel? A. It will receive an adequate supply of air and an adequate supply of fuel.

Q24. In your earlier study of the lighting art, have you familiarized yourself with the means which have been used to associate these two concepts, and in what sort of structures? A. Yes, sir.

Q25. What means, if any, do you find in the structure appearing as Fig. 1 on the plate of draw- 213
ings which have not been well-known in the art of lighting devices? A. I see none.

Q26. Are you familiar with the British patent to Argand No. 1,425 of 1784? A. Yes, sir.

Q27. How long have you known of that patent? A. Twenty-five years.

Q28. What relation, if any, does the Argand patent bear to the lighting art? A. It is the first real scientific presentation of the principles necessary for good combustion and protection of light by flames. It is the forerunner, in a sense, in a

214 rather big sense, of all flame sources, or many of the flame sources that follow.

Q30. Are you familiar with any devices prior in date to the patent to Argand, in which means were used in some form or other for protection or partial protection of the flame from the elements? A. A great many of them more primitive, way back in the centuries, many centuries.

Q31. You have from time to time observed the operation of devices such as those exemplified by the device of the patent in suit? A. I have.

Q32. Have you had any experience with lighting
215 highways and light protection on highways? A. A great deal in all of its aspects, all the aspects of highway lighting and safety lighting, such as traffic aids, traffic signals, highway lighting, head lamps for automobiles, and even emergency lights.

Q33. If, as you say, an open flame light is so primitive, can you assign any reason why, prior to the patent in suit, the bonfire construction with an open and unprotected wick should have continued in use? A. The growth of artificial lighting of course was largely in an interior world, and there had to be improvements made from the true
216 flame source on account of such nuisances as odor, flickering, soot, and so forth. Those same things had to be done outdoors for street lighting as was done in many of the devices to protect them from obvious things like rain and wind. And this is the last vestige of the primitive source in civilization. It stayed outdoors, was used in construction work and on highways, and occasionally in big interiors for emergencies because it was in a sense good enough, and has been used as a lighting device in that way for use outdoors for many years.

Q34. Now, directing your attention to the series

of photographs opposite page 56 of Luckiesh on 217
Artificial Light, have you seen the devices which are shown on that page before, or devices similar to those? A. Yes, many of them.

Q36. Where did you procure those particular photographs when you were preparing the book? A. From museums and private collections.

Q37. In reference to the Argand patent, which issued in 1784, did any of the devices disclosed on that page antedate that patent? A. They did certainly antedate Argand by centuries, some of them.

Q38. In any of the devices shown on that page do you find an application of the concepts of protect- 218
ing an open flame from the elements? A. It is, a metal enclosure with holes punched in it was a common way of protecting a flame from winds and rain, still leaving a little light to get out. There are one or two more on that page not quite so primitive, but very obviously protections against rain and wind. The lighting art is full of those illustrations.

Q39. None of them go so far as Argand, however, to specify surrounding and enclosing the flame with a metal chimney, dome, tube, or some such structure as that, do they? A. No. Argand's 219
was a real scientific approach to the problem.

Q40. From your examination of the Argand specification, and comparison with the structure of the patent in suit, do you find any concept disclosed in the structure of the patent in suit which is not present in the Argand specification? A. No, I think that Argand more than covers that of the Withrow device that you are referring to.

Q41. I now direct your attention to pages 14 and 15 of a book by W. H. Davenport Adams on "Lighthouses and Lightships." Can you describe

220 the operation of the structure shown in the upper portion of page 15? A. The upper structure is a housing with a top and some openings on the side in which crude fuel is burned, the side ports both admitting air and letting light out; the little openings below that first platform from the top, or rather, the top platform, and the larger ones below, were commonly used to let some air and draft up to the base of the fuel. There are a number of drawings of this sort on record, and they are rather crude, but the description fits that appraisal.

Q42. Would you explain the functions which the
221 top ports of this structure perform? A. To protect the flame or the burning material obviously from rain, and some partial protection from wind; likewise letting out the light. It is like a flare on a large scale, used on the highways of the sea, as we use the little flare on the roadways.

Q43. I will direct your attention to plate 48 from "Das Beleuchtungswesen," and more particularly to Fig. 113, I believe that is the last one in there, on the next to the last page of plate 48.

Q44. What function would that particular device perform? A. That very obviously protects the
222 burning material from rain. The side ports were also flame ports to let light out and air in, the flame out on the windward side. It performed all the functions of the modern cap.

Q45. What would be the date of that device as contrasted with the Argand patent which issued in 1784? A. It is my opinion it would be centuries preceding Argand.

Q46. You have seen examples of such devices in museums? A. Museums claim them 'way back, many centuries ago.

Q47. Have you examined the patent in suit to 223
any extent? A. Yes.

Q48. I wish to direct your attention to line 5 of page 1 of the specification and to line 10. In each of those lines the word "efficiency" is used. What is the meaning of the term "efficiency" as applied to lighting devices? A. "Efficiency" as applied to lighting devices is the same as, analogous to the efficiency of a motor. For lighting devices it is the light output per unit of energy input, and that energy input in an electrical device is measured in watts and watt hours, and in the case of an
oil burner in the number of pounds of kerosene 224
per hour. So the efficiency of an oil lamp is the light output in some acceptable unit, per pound of kerosene burned per hour, or any other acceptable unit of measurement.

Q49. Is there any other basis for measuring the performance of a lighting device? A. There is no other way of measuring the efficiency of a lighting device than that. I would rather answer it that way. There are other ways of measuring performance, but the ultimate performance of a lighting device that uses energy that one must pay for and
that gives light that is discharged and needed, it 225
is measured only by the light output per unit of energy input, or in this case kerosene burned per hour.

Q50. We shall from time to time during the course of this examination refer to the term "efficacy." What meaning has that in the lighting art? A. Efficacy is quite a different matter than efficiency. The efficacy of the light source from the viewpoint of the user, let us take a flare, a warning signal on a highway, it must be efficacious if it gives enough light to be visible under given conditions.

226 Now, if you asked a truck owner he would probably admit that that was one definition of "efficacy," and he would also be concerned, to him it would be efficacious if it gave enough light at a reasonable fuel consumption, and to him it would be more efficacious if it gave that same amount of light with less fuel consumption.

So we really come back, in thinking of efficacy, we come back inevitably to efficiency, the amount of light you get from the fuel that you pay for.

Q51. Referring again to the patent in suit, and particularly to lines 63 to 67, you have a copy,
227 have you not, Doctor? A. Yes.

Q52. Of page 1, of the specification, reading as follows: "The function of the disc 11 is to prevent the air entering the inside of the cap 7 from cooling the wick W to such an extent that the temperature of the oil passing up the wick is reduced below the desired point." What relation does the operation there described bear to fuel consumption and efficiency? A. In general, if, as a contribution the oil is heated up more in one device than another, in one condition than another, it can't result in anything else than a greater fuel consump-
228 tion, other things being equal.

Q53. Have you given any thought and study to lines 68 to 100 on page 1 of the patent specifications reading as follows:

"When the outer end of wick W is lighted the oil passing up the wick by capillary action is heated, thereby maintaining the oil in the region of the outer end of the wick at the proper flashing point. This heating of the wick is facilitated by the reflection of heat from the dome-shaped cap."

What is true or false about that statement? A. The reflection of heat from the inside of that dome

or cap, that inner surface. After that device is in 229
operation for a few minutes it is sooted up here, covered with loose soot, and it cannot possibly reflect any appreciable amount of energy or heat.

Q54. You are pointing in your answer to Fig. 1 of the sheet of drawings, the Withrow device? A. That is it.

Q55. Exhibit B? A. You read from the patent.

Q56. Yes. What type of surfaces form competent heat or energy reflectors? A. To state it popularly, not exactly, as a rule the thing that reflects quite a lot of light usually reflects quite a lot of heat. That isn't always true. Stating it on the 230
other side, there is one thing we do know and can be absolutely certain of, and that is that carbon black, loose black, which is called a black body in science, it is used for many scientific purposes because it reflects no appreciable amount of energy, radiant energy. It will absorb practically all of it.

Q57. Can you express in percentage points the approximate amount of heat or energy the cap 8 of Fig. 1 would reflect? A. The actual sooted surface there would reflect not more than two or three per cent.

Q58. Of the heat which it received? A. Of the 231
radiant energy.

Q59. Again calling your attention to the specification of the patent in suit, and particularly to lines 78 to 86, reading as follows:

"Air inlet openings 10 being above the lower edge of the cap leaves a space within the cap and above the flange of the wick holder for comparatively quiescent air. This quiescent layer of air in contact with the wick holder and the restriction of inlet ports to admit to the wick and holder only such air as is needed for combustion aids in maintaining the heat of the wick holder and wick."

232 Have you formed any opinion about the existence of that layer of quiescent air in the structure of the patent in suit? A. It may be reasonably quiescent in the state of zero wind velocity, but it is inconceivable that you could describe that as a layer of quiescent air when there is any wind velocity above practically zero.

Q60. You have examined the patent to Malcov, Russian patent No. 1163 of 1868? A. I have.

Q61. And are familiar with it and its specification? A. Yes.

Mr. Wisner: I offer in evidence as Defend-
233 ant's Exhibit I a model taken from the patent drawings of the Malcov structure.

Mr. Darby: I have no objection to the model being marked in evidence. I do object to those characterizations. I understand that you offer this as illustrating what is shown in the Russian drawings, and as applied to a burner body, flare body. I accept it for that purpose.

Mr. Wisner: You are correct.

(Marked Defendant's Exhibit I in evidence.)

Q62. What was the effect of the device disclosed
234 in the drawings of the patent to Malcov and exemplified by Defendant's Exhibit I? A. This upper surface certainly protected the flame from rain. These openings partially protected the flame from wind, as any partial enclosure will do.

Q63. Does the device contain a wick? A. Yes.

Q64. Do you find a wick tube in the structure? A. Yes.

Q65. A torch body? A. Yes.

Q66. Also a dome-shaped cap? A. Yes.

Q67. Do you find any flame openings? A. Yes.

Q68. What means, if any, were used for the ad-

mission of air? A. Air had to come in the flame 235
ports, of course, probably quiescent air would come in at the bottom, and as soon as there is a breeze, as in the case of these other ones, the windward flame ports become air ports and the leeward ports become flame ports.

Q69. According to the translation of the Malcov specification, and to that portion thereof which reads as follows: "Fig. 2 shows the regulator which is longer than the tube shown in Fig. 1. In the upper portion of the regulator cemented with red copper are provided perforations designated in
the drawing by dots. The upper portion of the 236
regulator on both sides is traversed by two arcs DD connected with ring C, but not constituting an essential part of the burner. These arcs are arranged for the purpose of heating the regulator and transforming the liquid into gas."

What would be the operative effect of two arcs DD, as shown in Fig. 4 of the drawing, Defendant's Exhibit B? A. Of course, heat would be conducted from this steel surface down to this ring, and eventually through the wick tube to the wick, just as it is in all kerosene devices, kerosene
lamps. 237

The Court: Do you get some light just from those holes in the top?

The Witness: They appear to be very small in the drawing.

Mr. Wisner: The patent drawing shows flames coming out all over the thing.

The Court: I understand that, but I was just asking whether there would be any light from the top.

The Witness: Not appreciably.

Q70. Now, referring again to the specification

238 of the patent in suit, and particularly to line 75 on page 1,—

The Court: With those holes in the top, of course, there would not be as much protection against rain as there would be in Fig. 1?

The Witness: That is the Toledo flare, the Withrow patent?

The Court: Yes.

Mr. Wisner: Can Your Honor see that?

The Court: Yes.

The Witness: Of course, small holes, as we know by experience in punching holes in
239 tin cans, do not admit much rain, that is, particularly when it has a sloping side; because of the surface tension the drops of water can't get through the hole.

The Court: The holes are rather small. Are those holes described in the patent, the size of them?

Mr. Wisner: It does not describe them, may it please the court, it says, "In the upper portion of the regulator," this whole thing is called the regulator in the patent, "are provided perforations designated in the drawing
240 by dots." So they must be very small.

The Court: Yes.

Q71. Referring back again to the specification of the patent in suit, and to lines 75 to 78, where it is explained that heating of the cap conducts heat to the wick holding collars 12 and 6 from their supporting flanges, flange 11 receiving reflected heat and being in contact with the lower edge of the heated cap, do you find that concept in the Malcov patent specification? A. Yes, a path of metal down to the wick tube. That is true of every kerosene device that has a holder around it. You cannot avoid that, it is fundamental.

Q72. Are you aware of any written descriptions 241
or disclosures of this heating of the wick tube about which you have been interrogated? A. I have run across a good many of them in the literature, I think there is the sentence in that book of mine.

Q73. Directing your attention to page 60 of Luckiesh on Artificial Light, where it says as follows:

"In the modern oil lamp the rush of air due to the pull of the chimney is broken and the air is diffused by the wire gauze or holes at the base of
the burner, these metal parts being hot also serve 242
to warm the oil before it reaches the burning end of the wick, thus serving to aid vaporization and combustion."

That was included by you in your book, that was not a new concept when the book was published? A. No.

Q74. You will notice in the specifications of the patent in suit, that it was first described as a structure being made of steel. In the event that it became desirable to conduct heat to the wick tube, what materials would suggest themselves to you
as being more efficacious? A. If I would take ad- 243
vantage of whatever they would give me, I would use copper. That would be about nine times as great as the conductivity of steel.

Q75. And that is the difference in the character of the two metals, which is well known? A. Yes.

Q76. Now, have you observed in operation as a torch of the structure in evidence, Defendant's Exhibit I? A. I have.

Q77. And under what weather conditions did you observe that? A. A several mile an hour wind and it was snowing.

244 Q78. Heavy or light snow? A. Light snow.

Q79. And how did it burn? A. Very well.

Q80. And in connection with your preparation of this case, you are aware of certain researches conducted at the University of Iowa? A. Yes.

Q81. And you were not present at any time during any of the tests which were made? A. No.

Q82. Have you anything to do with research methods, and are you familiar with them? A. I have spent my 27 years associated with them and devising them and correcting them.

Q83. And that is in connection with your work
245 with the General Electric Company? A. Yes.

Q84. Have you had anything to do with methods used in this research? A. I collaborated on the program of a research approach and it was carried through.

Q85. You have examined the data snbmitted by the testing engineers? A. Yes.

Q86. I now direct your attention to Figure 35 of the graph of Exhibit F. A. I have it.

Q87. What does that graph tell us about the relative efficiency of the structure of the patent in suit with and without the burner cap 8? A. That
246 shows—

> Mr. Darby: Just a minute. I object to that, Your Honor, as incompetent, irrelevant and immaterial. I do not think that it is of any issue in this case.
>
> The Court: Well, I will take this testimony, but I do not think myself that this point seems much of a basis of comparison. Mr. Witness, you may proceed.

The Witness: That wick is three-quarters of an inch in diameter (indicating an exhibit). Why wasn't it one-quarter of an inch in diameter, why

was it three-quarters of an inch in diameter? Why not compare the quarter-inch wick sticking out 1½ inches, in that black bomb, with that particular device? There is no fundamental way of comparing, if you use the open torch. The only way you arrive at a fundamental is control of all variables except one. The only way you can get basic, foundational information on the effect of a cap on efficiency is to test it on and off of a given device. That is the research approach. There is no other way. 247

The Court: Have you used that device without any wind, with the wick up ⅛th of an inch—in a wind would you use it ⅛th of an inch? 248

The Witness: You mean open?

The Court: Yes.

The Witness: I don't think so, but there is no data indicated that you need 1½ inches either.

The Court: What would you say you would need?

The Witness: From what I know now, I would take a chance on a half an inch.

(Question 87 was read by the reporter.) 249

A. This shows within the limits of error of data that that device, with a flame guard, always has a lower efficiency than when it has no flame guard, that is, for velocities from zero to 12 miles an hour. It also shows that the efficiency in zero wind and very low velocities, under a mile an hour, is extremely low.

Q88. And where are these torches usually used, Doctor? A. On the ground, so they act as a light source, of the order of 5 or 6 or 7 inches above the ground.

250 Q89. Have you given any study to wind veloci-
ties at any time? A. Oh, yes, it happened that I
had a good deal of flying during the war and I
found out that wind velocities increased with
height. I gave a lecture on aerodynamics along
those lines, and I have had in my mind pretty well
velocities. We know that the earth produces a
drag, that is the movement of the earth produces a
drag on atmosphere, and velocities close to the
earth's surface are much lower than at a height.

To refresh my mind, I asked Mr. Mize, the chief
meteorologist of the Cleveland station of the United
251 States Weather Bureau, to find me the latest data
for representative parts of the whole United
States, and he sent down to me, to check my
memory—

Q90. A document on the form of the United
States Department of Agriculture, Weather Bu-
reau? A. Yes.

Q91. And what does this document show about
wind velocity two feet from the ground? A. These
were taken at evaporating stations where they keep
the anemometer two feet above the ground. At
two feet above the ground the average annual
252 velocity for seven evaporating stations over the
country, pretty well scattered, was about two miles
an hour, at two feet.

Now, he also gave me the data from the Weather
Bureau station in the vicinity of the evaporating
stations. Those stations have their anemometers
about 50 to 100 feet above the ground, and even at
50 to 150 feet above the ground, the average veloc-
ity, in the clear, on the anemometers used, was only
8¼ miles an hour at an average height, say, of 100
feet.

Q92. Can you state, based upon the information

which you have, what wind velocities will be at 253
about 6 inches from the ground, on the average? A. Well, if the average annual velocity is of the order of two miles an hour, two feet above the ground, I should state that the estimate for 6 inches above the ground would be of the order of one mile an hour, and the actual data on record show very few yearly averages at 2 feet above the ground that are more than 2 or 2½ miles an hour. It would be my estimate that it would be a safe contention that at 6 inches above the ground the average wind velocity over the entire year, averaged over the United States where the Weather Bureaus are, 254
would be less than a mile an hour.

Q93. What, in your opinion, is a fair basis for testing the performance of one of these flares such as Plaintiff's Exhibit 19? A. Well, you learn something definite and fundamental with zero wind velocity. That is a basic approach that anybody skilled in research would make. Then if we were only going to make one more test I would say that it ought to be an average velocity, maybe one or two miles an hour, or we might extend it to double that. Now, if we could not have a high efficiency and good operating characteristics as a light source 255
over the entire range, it is perfectly obvious, from the standpoint of design, that it should be designed for high efficiency and high efficacy over the miles an hour wind velocities found most of the time.

For example, a 20-mile an hour wind could only blow ten per cent of the time if all the rest of the time the wind was absolutely still, in order to get an average of two miles an hour. If we wanted to take an average of one mile an hour, a 20-mile an hour wind could only blow five per cent of the time with the air still 95 per cent of the time, to have that average.

256 In my opinion, to remain efficacious the operating characteristics of a device like this, from the standpoint of the user, particularly the fuel purchaser, should be within a range of say zero to five miles an hour or zero to two miles an hour; in that low range.

Q94. Referring again to Fig. 35 of Exhibit F, purporting to be a graph of efficiency, will you translate into ordinary terms the factors which were taken into account as disclosed in that graph? A. Well, candle power is one way of measuring light output in a crude usage of this sort, where it
257 is generally horizontal. That is the mean horizontal candle power—that is, that is what was measured. When we say illumination, that means illumination at one foot and it is taken that way because we may have a one-foot candle at one foot, and we know we have one candle power source here. Of course, fuel consumption, pounds of kerosene per hour, is taken and divided by the other, and the result is efficiency.

Q95. How was efficiency calculated by one being divided by the other? A. By the light output and some acceptable term of kerosene consumption per
258 hour.

Q96. Drawing your attention to Fig. 36 of Defendant's Exhibit F, what are the variables shown in that particular graph? A. Fuel consumption is the ordinate against air velocity.

Q97. What does that graph show? A. That shows, with the exception of actually still air and velocities below 12 miles an hour, the fuel consumption is actually increased with the flame guard, as it should be; it is actually increased by the flame guard.

Q98. Now, directing your attention to Exhibit

37, what were the variables taken into account 259
there? A. That is measuring the illumination at
one foot, measuring the foot candles, but that can
also mean candle power in that direction.

Q99. What does that show about operation of the Toledo structure, in very light air? A. In very light air it emitted practically no light. Putting it in visualizing terms, the candle power was less than one-tenth from that which you would get from a lighted match.

Q100. Will you explain what that instrument is
that you have, Doctor? A. This is just a little elec-
tro cell, sensitive to light. This is read in foot 260
candles. Here we will have to have a little light
naturally. Now I am going to hold this match one
foot away, that would make it go up one division.
At six inches it should make it rise about four foot
candles. (Witness demonstrating with lighted
match.) That would give you roughly the equiva-
lent of one-tenth of a match.

Q101. Observations were also taken with the wick extended to one-eighth of an inch, as recommended by the plaintiff? A. Yes, with the same curve.

Q102. Under what conditions of wind will the 261
patent and its air ports operate as described in the
specification, the air ports being marked 10 on Fig.
1 of the drawing? A. Only in the conditions of
no wind, that is, still air, will these be air ports
(indicating), there being a draft up there from
these air ports and out the flame ports. As soon
as we have a movement of air horizontal, as is
usually the case, these air ports push the air in on
this side and pull it out this side (indicating) and
we get the velocities that are measurable more than
zero, and when we get such velocities this becomes

262 an air port (indicating) and that becomes a flame port. (Indicating.)

Q103. By air port you mean an orifice indicated by 9 on Fig. 1 of the patent drawing? A. Yes. In a wind they cease to function as an air port. We found by test that these did not supply enough air apparently at zero wind. That was responsible for the extremely low candle power. If they do not function at zero wind they are not needed for any winds above it because the flame ports become air ports automatically.

Q104. You are now referring to the air ports
263 which are marked 10 on Fig. 1? A. That is right.

Q105. And you are familiar with the patent to A. O. Rutz, a device of that type exemplified by Fig. 3 of the plaintiff's drawing, Defendant's Exhibit B? A. I am.

Q106. What function is performed by the shell 13? A. In the Rutz patent?

Q107. Yes. A. Shell 13 obviously and actually protects the flame from spilled liquids and protects from gusts of wind, air velocities, we will say, and has ports through which the flame emerges.

264 Q108. Disregarding the supposed operation of the structure of the patent in suit as an efficiency increaser, is there any functional difference, so far as protection is concerned, between the Rutz patent and the patent in suit? A. None at all in principle.

Q109. They should be interchangeable? A. They should.

Q110. I hand you a device consisting of a torch body with a superstructure, and I ask you whether you have ever seen that particular device before? A. Yes, I saw that device in operation.

Q111. You observed it operating as a flare? A. 265
Yes.

Q112. What sort of a flame guard is on that particular device? A. It is actually of the Rutz device, similar to those used on my gas stove at home.

Q113. Similar to Fig. 3? A. Similar to Fig. 3.

Q114. Under what weather conditions was it operating? A. There was about a four or a five mile wind, I should estimate, and it was snowing and when I applied all the wind I could apply, I was surprised to find that I could not blow it out.

Q115. How did you finally put it out? A. By
the snuffer. 266

Q116. You placed the snuffer cap and you placed it over the structure? A. Yes like this. (Indicating.)

Q117. Directing your attention, Doctor, to the Anthes structure shown in Fig. 2 of Defendant's Exhibit B, what, if any, similarity do you find between that and the Rutz structure shown in Fig. 3? A. It is quite similar in principle. There is an enclosure with an imperforate top, it has flame outlets, it has metal connecting, as all devices, all oil lamps, have, as a rule they have, connecting to
the wick here, and of course in this case to the 267
tube, and then it has air ports in the bottom, just as the Rutz patent.

Q118. Have you any opinion as to the desirability of placing air holes in the bottom as Anthes and Rutz have done? A. We know as a matter of experience with kerosene lamps that we have put them there and kept them in the bottom, and that that is the best position with quiet air, that is the natural place, the desirable place for them, because you get an upward draft.

Q119. You are now pointing to the Anthes Fig.

2? A. Yes, Fig. 2. The air port 6 is getting the
268 natural upward draft, so it is desirable, as shown by Argand rather scientifically, and as we have observed the course in oil lamps for years; it is the efficient way to get oxygen or air to the flame.

Q120. Are you familiar with the British patent to Salsbury No. 16,524 of the year 1925? A. Yes.

Mr. Wisner: I offer in evidence as Defendant's Exhibit J a structure prepared from the patent drawings of Salsbury.

(Marked Defendant's Exhibit J in evidence.)

Q121. Now handing you Defendant's Exhibit J,
269 you have seen that structure before? A. Yes.

Q122. Where are the air ports positioned in that particular structure? A. They are in the bottom and sides, both.

Q123. Both. Have you observed that device in operation? A. I have.

Q124. Under what weather conditions? A. Under weather conditions of a wind velocity of a few miles per hour and a moderate snow storm.

Q125. How did it function as a flare? A. It functioned very well.

Q126. Did you make any attempts to blow it
270 out? A. I did.

Q127. From what direction did you blow? A. From a horizontal position; I was unable to blow it out. It was blown out rather readily when you blew down on the top of it.

Q128. Is that the usual direction of a wind? A. No, it is usually horizontal.

Q129. Tell us, there has been some mention in the patent specification, particularly in lines 80 to 83, of what they term a layer of quiescent air. Do you find any such feature in the Anthes device, Fig. 2 of Defendant's Exhibit B? A. No.

Q130. That is true, is it not, under any conditions of operation? A. That is true under any conditions of operation, there couldn't be a layer of quiescent air. 271

Q131. There is likewise some mention in the patent specification of a heat-receiving flange identified as the flange 11. Do you find its equivalent in the Anthes structure? A. Not any surface specifically designed for the purpose. Of course, any surface of a housing surrounding or partially surrounding a flame is bound to receive heat radiated from the flame.

Q132. That is true, is it not, of all lamp structures in which an open flame is used? A. All sorts of kerosene lamps, there is no way to avoid that if you wish. 272

Q133. What do you say as to whether or not there is any functional difference in the positioning of the air holes in the bottom of the flange as against their being positioned in the side? A. In a condition of zero wind or relatively still air, it is the very logical place. The air, provided it has an opportunity, will go right on through here, whereas, for example, if it is on the side, the air must turn rather a sharp corner. Air does not 273
like to turn sharp corners.

Q134. I hand you Plaintiff's Exhibits 33 and 34, purporting to be the structure shown in the Bolser case. Will you point out on those exhibits in what position the air holes were or the air inlets are to be found? A. In Exhibit 33 the air ports are apparently in the side, as in this case.

Q135. You are referring to Fig. 1? A. As in the case of the Withrow device, Fig. 1 of Exhibit B.

Q136. In the other exhibit which you are shown what is the fact? A. The fact again appears to

274 be that the air ports are in the sides as in the case of the Withrow device or Toledo flare illustrated in Fig. 1 of Exhibit B.

Q137. Did you prepare any statements showing a comparison of the operation of the Anthes or defendant's flare with that of the patent in suit? A. From rather voluminous data I condensed it to a table of average efficiency. In the tests—

Mr. Wisner: Just a moment. I offer in evidence as Defendant's Exhibit K, a statement entitled "Comparison of Performance of Plaintiff's Flare with and without Flame
275 Guard, Comparison of Performance of Plaintiff's Unprotected Flare at Various Wick Heights, and Comparison of Performance of Plaintiff's and Defendant's Flares."

Mr. Darby: Just a minute. Could I see that, please?

Objected to as irrelevant and immaterial.

The Court (to the witness): You take certain winds—

The Witness: With the condition of no wind, a ⅛th inch wick, the Anthes efficiency is about 20 times greater than that of the To-
276 ledo device—the efficiency.

Q138. Will you point out the reason for that? A. The chief reason being while the consumption of kerosene burned per hour is roughly twice as great in the case of the Anthes device, as compared with the Withrow device, the candle power in this device is of the order of a ratio of about 200 to 4, that would be 50 to 1, roughly. This candle power is of the order of 1/50th of this (indicating), and even though—

The Court: And by "this," you speak of what?

The Witness: The Withrow device. It is 277
1/50th of that in the Anthes device. Nevertheless, the Anthes device burns about twice as much kerosene per hour as the Withrow device, and the net ratio of candle power output to kerosene input is about 20 times greater for the Anthes device than the Withrow device. In other words, the Anthes device is 20 times more efficient as a light producer.

Q139. You argue from that that the devices are different? A. That they must function differently to get the ultimate result.

The Court: I am inclined to agree with 278
you, Mr. Darby, that this is not material. But in cases of this kind where there may be some question about it perhaps it is better to allow it, if it isn't going to involve the taking of too much testimony—

(Marked Defendant's Exhibit K in evidence.)

Q140. Will you further point out the operative differences between these two structures, Doctor? A. You mean in this table?

The Court: Hasn't he already done so?

Mr. Wisner: He only referred to the still 279
air condition.

A. He wants me to proceed with the table. The same results were obtained with quarter-inch wicks and three-eighth-inch wicks. I do not need to repeat the data; they were the same general results; as we got to a wind velocity of around two miles per hour the efficiency of the Withrow and Anthes devices are approximately equal, instead of having been twenty times greater in the case of Anthes over Withrow.

280 The Court: They are about the same at two
miles an hour?

The Witness: Beginning at about two miles an hour, their efficiency becomes about equal, with the wind blowing two miles an hour.

The Court: When you are speaking about efficiency, you are speaking about light?

The Witness: Light production, the candle
power per unit of kerosene, blowing at two
miles an hour. As we pointed out, the candle
power of the Withrow device is about one-
fiftieth or fortieth, about one-fortieth that
281 of the Anthes device. We talked about the
efficacy, but there is no flare in existence that is
capable and adequate as a warning signal in
a tremendous pea-soupy fog. So the reduc-
tion of candle power per unit of kerosene or
per device is a very important matter. There
are no ascertainable limits as to the candle
power we need, so there is no virtue to pro-
duce one candle power or the equivalent of
one-tenth of a candle power, as we saw this
morning, because in still air it might be visible
at 500 feet, or in clear air; we have all kinds
282 of conditions. The real purpose of a light
source is to produce as much light as you can
produce per ounce or per gallon of kerosene.

Mr. Owen: May I inquire whether these tables which are being considered by the witness are based upon the Croft tests?

Mr. Wisner: I thought I made it clear that they were.

Mr. Owen: I did not understand; they were not tests that he made?

Mr. Wisner: No, they are simply taken from there.

The Court: You gentlemen haven't agreed on a definition of efficiency. 283

Q142. Will you give the definition again? A. There is only one fundamental definition of "efficiency," that is the ratio of output to input, no matter what kind of a device it is. In this case the output is light and the input is kerosene.

Q143. Is it a fair test, in your opinion, Doctor, to compare the efficiency of the structure represented by Plaintiff's Exhibit 19 with the structure represented by Plaintiff's Exhibit 10? A. No.

Q144. From a comparison of these exhibits, can you give me any scientific determination of the 284
effect of the addition of the burner cap 8 on Exhibit 19? A. You can make no comparison unless you keep control of all variables but one. In comparing the effect of the cap you must take it on or leave it off the same device and find out the effect by controlling all variables that are controllable, with the exception of the cap. To compare it with that other torch—

Q145. You refer to Exhibit 10? A. Exhibit 10, you are not comparing it with the prior art properly and appropriately and adequately represented. That is just one instance of the prior art. There 285
is nothing fundamental about that particular torch with a three-quarter inch diameter wick and an inch and a half extension, and other details.

Q146. Is it possible to make any reliable measure of the illumination of the light source with the human eye unaided by anything? A. Totally unreliable.

Q147. Does the rotation of a flare in a test for wind velocity at the rate of four rotations per minute shed any light on the operation of that structure in a wind? A. It would shed some light,

286 but you are introducing a variable that never exists in practice.

The Court: It would depend on the strength of the wind.

The Witness: But you introduce a variable that you never have in practice, because in rotating that an air port, and then an opaque section between air ports are alternately following each other around and the flare is constantly, the flame is constantly being pushed from one side to the other side, and it is a kind of operation that is just never found in
287 nature, so in research we would not do that, that is introducing a variable that might just as well be kept constant. You can direct the air stream, or rather project the air port toward an air stream, the axis of the air stream, and when you do that with all torches, then you have the same effect on one as with the other. But by rotating you are introducing something that is just non-existent in practice. It is another variable that takes place with these flames shooting in and out of the different ports.

288

Cross Examination by Mr. Darby:

XQ148. Dr. Luckiesh, if I gave you as a scientist Plaintiff's Exhibit 19 and Plaintiff's Exhibit 10, and asked you to ascertain for me how much kerosene was consumed by each of them, both of them, over the same period of time under the same conditions, would you be able to do it? A. Yes.

XQ149. And from the viewpoint of fuel economy you would be able to compare one with the other? A. Yes.

XQ150. Strictly speaking, in the terminology of 289
illumination, you would not call that a comparison of efficiency between the two devices, would you? A. I would not use the term in that way.

XQ151. You would not use the term in that way. However, if I was the one who conducted that comparison and told you that one or the other of them was more efficient from the viewpoint of fuel consumption, would you understand what I meant? A. I wouldn't be certain.

XQ152. You wouldn't be certain, you would have an idea? A. I think I would know what you were driving at, but you would have no concrete under- 290
standing, in my mind.

XQ153. It certainly wouldn't be scientifically accurate, would it? A. No.

XQ154. I think you made the statement, Doctor, that in your opinion the Withrow structure presented nothing over the prior very ancient art; did I correctly understand you? A. Nothing in principle over the Argand description.

XQ155. I don't believe you limited it to Argand —did you mean to limit it to the Argand description, or did you intend to include everything in the prior art? A. It would include—I would state it 291
this way: Every principle involved there is found in the prior art.

XQ156. You did not mean that the structure was found in the prior art, did you? A. Principle, certain aspects of the structure, yes.

XQ157. Did you mean that that exact structure was found anywhere in the prior art? A. By "exact" do you mean exact configuration?

XQ158. No, I mean that exact combination. A. I hesitate to interpret the word "exact." I would

292 say that the principles involved there are found in Argand.

XQ159. And preparing yourself to give the answer you did on direct examination, you, of course, made yourself familiar with each of the patents of the prior art that are here before the Court, by the Defendant? A. Yes.

XQ160. You did? A. Yes.

XQ161. Of course, you studied the combination of elements which constitute the claims of the patent in suit, as part of your study, did you not? A. To the best of my ability.

293 XQ162. Will you agree with me, Doctor, that there isn't a single instance of the prior patented or published art which shows the combination recited in any one of the four claims in suit? A. I would say, if you want to talk principle in combination with—

XQ163. Just confine yourself to my question, please, Doctor. A. What is the question?

(Question repeated by the reporter.)

A. I will have to refer to the claims.

XQ164. Will you do so, please? A. Those claims are 2, 5, 11 and 12?

294 XQ165. That is right, sir. A. I would say that I do not believe I agree with you on Claim 2.

XQ166. All right. Let's take that first, then. First, you better finish your answer. You do not agree with me as to Claim 2. Do you agree with it as to Claim 5? A. I would not agree with you on Claim 5.

XQ167. Do you agree with me as to Claim 11? A. I think I would agree with you on Claim 11.

XQ168. And do you agree with me as to Claim 12? A. No.

XQ169. You agree with me as to Claim 11, but

not as to Claims 2, 5 and 12. Is that right? A. 295
That is right.

XQ170. Well, take Claim 2. What patent of the
prior art shows that combination of elements? A.
Do you mean, did your question involve patents?

XQ171. What patent or printed publication dis-
closes the combination of Claim 2, in your opinion?
A. My opinion is that a number of those—

XQ172. Just give me one, please. A. I cannot
point them out from here. They are in the records.
Let us say the Malcov, the Russian patent.

XQ173. The Russian patent? A. Yes.

XQ174. All right. Now, will you turn to this 296
Malcov patent? Will you point out where in the
Malcov patent there is the torch body? A. I
would call it below.

XQ175. In the lower figure? A. Yes.

XQ176. And that pear shaped structure is the
torch body? A. I should think so.

The Court: That is on that photostat of the
drawing of the patent for the year 1868?

Mr. Wisner: That is right, Your Honor.

XQ177. What is the opening for the wick? A.
The opening for the wick?

XQ178. Yes, in the Russian structure. A. Just 297
above "C" apparently.

XQ179. And the wick extends up through that
opening, does it? A. It does when it is burning.
It would have to in order to burn.

XQ180. That is your understanding of the dis-
closure of the patent? A. Yes.

XQ181. And what is the flame guard for the
wick mounted on the outside of the torch body?
A. That is the whole housing with some holes in
it, lateral holes.

298 XQ182. What is the cap? A. The cap would be this part of it.

XQ183. And is that cap provided with an imperforate top wall or a perforated top wall, as recited by the claim, in the Russian patent? A. Will you define "imperforate?"

XQ184. Has the cap of the Russian structure perforations in it? A. Yes.

XQ185. Then it is not an imperforate cap, is it? A. To all practical purposes.

XQ186. I say then it is not an imperforate cap, is it? A. Not in your sense.

299 The Court: Well, in what sense?

The Witness: In the practical sense that rain will not come through and put out the flame.

XQ187. The practical sense of what? A. The surface is curved.

XQ188. Does the Russian patent make any reference to that? A. I don't know. We have just a translation. I am not familiar with it.

XQ189. Have you read the translation? A. Yes.

XQ190. Is there anything in the translations to
300 support your statement? A. It does not go into great detail.

XQ191. As a matter of fact, the translation is very incomplete, isn't it? A. Very.

XQ192. And it is very ambiguous, is it not? A. Well, anything incomplete that tries to cover territory is ambiguous, as a rule.

XQ193. And you understand, don't you, that this is a translation of the specifications of the patent? A. Yes.

XQ194. Is there any other patent or publication of the prior art—well, I withdraw that for a min-

ute. As a matter of fact, doesn't this Russian 301
patent describe packing the top of the wick tube with charcoal? A. Charcoal or some other material.

XQ195. The wick itself does not extend up through it at all? A. It is packed around there, that is the best I could say.

The Court: Where is there any charcoal?

The Witness: You put asbestos or some other non-combustible material packed around there.

The Court: What would be the purpose of that? 302

The Witness: To make more of a protection from the wind.

Mr. Darby: Of course, we contend that that model is not made in accordance with the patent, Your Honor.

The Court: I understand.

XQ196. Does the Russian patent recite that this device is to be used as a torch or flare? A. I don't believe it does.

XQ197. What other patent of the prior art, in your opinion incorporates the combination of elements recited in Claim 2? A. I don't know of 303
any patent that would.

XQ198. Or any publication in evidence for the defendant in this case that recites the elements of Claim 2? A. How about the old Lighthouse? Suppose they put a wick in it and burned the wick in oil.

XQ199. For your information, Doctor, we are not engaging in suppositions. My question is confined to disclosure. A. I would not want to be bound by that.

XQ200. Will you agree with me that there is no

304 other patent or publication in the prior art that discloses the combination of elements of Claim 2? A. I cannot agree with you, because I am not sure that I know of all—I know of none.

XQ201. I think you said in your opinion Claim 5; you would not agree with me that there is no patent or publication of the prior art in this case that recited elements of Claim 5? A. That is right.

XQ202. Now, what patent or publication of the prior art did you refer to? A. As I read that hurriedly, it seemed to me that it did not differ from
305 Claim 2 enough so I would include it with 2, and I would use the same illustration that we gave, Malcov.

XQ203. The Russian patent? A. Yes. I may have missed a phrase or two, but it seems to me to be about the same. I would cover it exactly the same way.

XQ204. Now, having in mind, as you pointed out to me a minute ago that the wick in the Russian patent does not extend up through the top, point out to me in the Russian patent where there is means to hold the wick in place. A. As I recall
306 it, there is a tube within a tube, there is a tube that slips out over the tube that holds the wick.

XQ205. In the Russian patent? A. Yes, or the other way.

XQ206. Well, see if I understand what you mean. In the drawing, Defendant's Exhibit B, which purports to represent it—you mean there is a tube inside the tube A of that drawing? A. Inside the tube A—yes, that is my recollection. That is the best we could get out of our combined ideas of what the patent meant.

XQ207. There is quite a little dispute between

you as to what the Russian patent did mean? A. 307
As we said before, it is rather an incomplete sort of a statement.

XQ208. You had to do a lot of arguing back and forth and a lot of conjecture? A. Well, we had to discuss it.

XQ209. I presume all of you had different ideas about it? A. I don't think so, eventually.

XQ210. Eventually, although you had different ideas to start with, eventually you did come to an agreement? A. As a matter of fact, as I looked it over, I quite agreed with two others, my first view
of it, and they had been studying it. 308

The Court: You mean they agreed with you?

The Witness: No, I found my diagnosis of it checked with what they had concluded, but it is a very difficult thing because it did not describe in words.

The Court: Did you change your opinion?

The Witness: No.

The Court: They came around to your opinion?

The Witness: No. They had the same
opinion independently. They asked me what I 309
thought this was and what that was, and my recollection is I happened to agree with them.

XQ211. As a matter of fact, it was at best a guess? A. It was an intelligent guess, yes.

XQ212. I would not expect an unintelligent guess from you, Doctor. Now, the structure shown in Defendant's Exhibit B, the Russian structure, as I understand you, your interpretation of the disclosure is that there is a tube within a tube? A. Yes, that is our idea there.

XQ213. So that that inner tube is not shown in

310 that drawing? A. Either the inner or the outer, but it must be the inner, because of this (indicating).

XQ214. So that the means referred to in the claim of the patent, means to hold the wick in place, is the tube itself? A. The inner tube.

XQ215. Now, Claim 5 of the patent also calls for an imperforate top wall. And I think you agree with me that the Russian patent shows a perforate top wall, but Claim 5 also includes side flame openings? A. That is the one I was going to agree with you on. Is that in 5?

311 XQ216. Yes, side flame openings. A. I missed that one.

XQ217. Then you will agree with me that there is no patent or printed publication of the prior art which shows a combination of Claim 5? A. The exact combination?

XQ218. Yes. A. No.

XQ219. And I think the other claim was Claim 12, that you would not agree with me as not disclosed in the prior art? A. The one with the side openings, those, of course, I know of none. Never used side openings—that word steered me away

312 from that right away. Reading it hurriedly I missed it in No. 5.

XQ220. Didn't you also miss it in Claim 12, Doctor? A. Yes, I did.

XQ221. Then will you now agree with me, Doctor, that there is no printed patent or printed publication in evidence in this case that discloses the combination of elements exactly as recited in Claims 2, 5, 11 and 12 of the patent in suit? A. I would say that none discloses the exact combination.

XQ222. It is a fact, is it not, Dr. Luckiesh, that

in none of the prior art patents or publications in 313
this case is there disclosed the exact combination of elements recited in Claims 2, 5, 11 and 12, or equivalent elements for any one or more of them, where they each perform the same purpose as each of the elements? A. I don't know what you mean by the last half—equivalent elements. I agree on the first half.

XQ223. You said side flame openings was an element that you did not think existed in the prior art? A. I mean in combination.

XQ224. Therefore, there was nothing equivalent
to flame openings that existed in the prior art in 314
that combination? A. Not in combination where the wick is definitely used, specified and agreed and described.

XQ225. Now, you referred to this Rutz patent, as to the structure which has been put in evidence—

Mr. Wisner: I offer the structure of the Rutz patent in evidence.

(The same was received in evidence and marked Defendant's Exhibit L.)

XQ226. As I was saying, you referred to the
Rutz patent which is now marked Defendant's Ex- 315
hibit L, the structure, and I think you stated that you saw this device, Exhibit L, in operation? A. Yes.

XQ227. And you tried to blow it out and, if I correctly understood your answer, you said that you were surprised that you could not? A. That is right.

XQ228. Well, why were you surprised? You expected to be able to blow it out? A. I had never seen that much, experience in flames that I could not blow out.

316 XQ229. I understand that you used to play the trombone, Doctor? A. That is right.

XQ230. And you have what is generally referred to as good wind? A. Some.

XQ231. So you had no experience with flames of this general character, that you could not blow out? A. In general, I could generally blow a flame out.

XQ232. And you were quite surprised to find you could not blow it out in this case? A. Rather astonished.

XQ233. And what would you say was the veloc-
317 ity of your breath when you blew at it? A. I have never measured it, but I can tell you it is far above the average that we find outdoors.

XQ234. And you think it is rather several miles an hour? A. Oh, yes, I think that is possible.

XQ235. Had you ever tried to blow out the plaintiff's structure or the defendant's structure, prior to the time that you tried to blow out Defendant's Exhibit L? A. I don't believe I ever did.

XQ236. You, of course, had seen the plaintiff's and defendant's structure before you saw Defend-
318 ant's Exhibit L, had you not? A. Oh, yes.

XQ237. And you had been told what they had been designed for and used for? A. Yes.

XQ238. Were you told that they had to pass certain state tests? A. State tests and regulations.

XQ239. And were you told that ran as high as 40 miles an hour? A. Yes.

XQ240. Did that surprise you? A. I could not see the sense in it.

XQ241. Well, did that surprise you? A. Nothing surprises me of that sort.

XQ242. You accepted that, as a matter of fact? A. Yes. 319

XQ243. And yet, although you were not surprised that the defendant's and plaintiff's structures were required to withstand a wind velocity of 40 miles an hour, you were surprised when you could not blow out Defendant's Exhibit L with your breath? A. I could not take a strong pencil of air from my lips and blow it into the hole.

XQ244. Your surprise was occasioned by the particular structure of this patent? A. I was surprised how effective it was.

XQ245. And was your surprise occasioned by 320
the particular construction of this cap? I gather from your last answer that you had to contract your breath in a pencil of air— A. My surprise was due to the fact that I did not stop to analyze it before I tried to blow it out.

XQ246. As a matter of fact, this cap of the Rutz patent is for a gas burner on a stove? A. Yes.

XQ247. I think you stated on direct examination that you had caps like this on your stove, or very similar to it? A. Yes.

XQ248. And it never occurred to you, with your familiarity with those caps for years, that a thing 321
like that could withstand the wind that it did? A. I never tried it in a wind. I know it always stood up on our gas range. I never associated it with wind.

XQ249. One of the features of this Rutz patent —have you the structure there or the figure on Defendant's Exhibit B? A. Yes, sir.

XQ250. One of the features is it is provided with a number of air ports in the bottom flange, is that right? A. Yes, there are six or seven.

XQ251. And as revealed by the patent itself,

322 particularly in Fig. 2, those holes extend all the way around, is that right? A. That is my recollection. They show there. (Indicating.)

XQ252. So that there is virtually a cylinder of air that completely surrounds that gas burner; is that correct? A. Yes.

XQ253. The gas burner is heated all the time? A. Yes.

XQ254. And while the gas burner is heated air is rising through those holes and going upward, is that right? A. Yes.

XQ255. So that at all times there is virtually an
323 insulating—never mind the insulating—there is virtually a cylinder of air surrounding the burner and between the burner and the metal shield? A. A slowly moving cylinder, yes.

XQ256. It is a slowly moving cylinder? A. Yes.

XQ257. Now, how much of a wind would you think would be necessary to disintegrate that slowly moving cylinder and blow out that pilot light? A. It depends what chance the wind has at it, where the wind could hit it. Here is a skirt down here. (Indicating.)

XQ258. Let us assume that it comes right in
324 through one of the holes. How much of a gust of wind would be necessary to blow out that light? It would not be a very strong wind, would it? A. Oh, yes. The air does not like to go through small holes and around corners, particularly when you push on it hard.

XQ259. How strong a wind would that slowly moving cylinder of air rebuff so as to prevent it from blowing out the pilot burner? A. I do not see where that has anything to do with it. Wind is merely a transfer of momentum from one infinitely

small amount of air to another, and then the whole mass moves. 325

XQ260. On a gas stove you want to avoid your pilot light from going out? A. Yes.

XQ261. It is dangerous? A. Yes.

XQ262. You are burning gas there? A. Yes.

XQ263. And that gas is under pressure? A. Very low pressure, of course.

XQ264. But sufficient to cause it to flow? A. Yes.

XQ265. And that has to be maintained at the necessary pressure? A. Very definitely.

XQ266. Otherwise the pilot light is apt to go out 326
and then you have escaping gas, is that right? A. Yes.

XQ267. And you want to protect that pilot flame from being blown out by currents of air, you certainly want to do that, don't you? A. Yes.

XQ268. And this slowly moving air cylinder would not protect the flame from a very strong current of air, regardless of how it got in, would it? A. I think it is a matter of definition of strong wind, of course. That wind maintained itself, of course; that flame is easier to blow out than a large kerosene flame, of course. 327

XQ269. So I understand therefore that you must protect that flame from say a gust of air, such as by closing a door suddenly? A. That is right.

XQ270. In a gas device of that kind? A. Yes.

XQ271. And that is pointed out in this Rutz patent in this language, and I read from page 2, beginning at line 96, as follows:

"In order to insure more perfect combustion I provide the hood dome with a series of auxiliary vents, 13, that encircle said dome above the firing ports, and hence air to supply oxygen to the flame

328 will be more readily drawn up through the bottom of the hood and caused to pass in vertical stratas," and this is the part that I desire to call particularly to your attention, "and caused to pass in vertical stratas about the pilot light and from thence through the firing ports and vents to effectually check cross currents of air while the small pilot light is burning."

The patentee points out just what you and I have agreed on. A. I would not say so. I would say quite the opposite. I think a lot of the statements are verbiage and sometimes meaningless. I think
329 that that statement is largely words.

The Court: What do you think of it?

The Witness: I think this is greatly shielded from gusts.

XQ272. Just from gusts? A. Things of that sort.

XQ273. But from the language that I read to you about this vertical strata of air around the pilot to effectually check cross currents of air while the small pilot light is burning, don't you agree that the patent specification points out that by that small column of slowly moving air, as you have
330 characterized it, he expects to check all the wind that that device is subjected to in normal domestic use? A. I would say that that movement of that upper column of air outwards is secondary, that is, it has a secondary protecting influence.

XQ274. Will you confine yourself to the language of the patent? A. I do not support that language; I do not hold any brief for that language.

XQ275. Isn't that what the language means to you? A. That that column is a protector against these drafts?

XQ276. Yes. A. Yes, and I would agree that it 331
is in a minor way, but not in the implied way.

XQ277. You understand, don't you, that the Rutz patent points out that the cap at the very top—would you point to the cap at the top?—points out that that cap is not to be heated at all, in other words, that the pilot is so positioned that it does not heat that cap? A. Of course it is not so, because all you have to do is put your hand on it.

XQ278. Do you understand from the Rutz patent that that is what is described? A. I frankly paid no attention to those phases of the Rutz patent because to me they are meaningless. 332

XQ279. Well, the patent says this:

"It is also essential to perfect combustion that the torch head tip, 9', which burns a constant pilot flame, should be spaced at a distance equal in all directions from the walls and dome of the hood to prevent generation of foul gases through the heating of said hood." Does that mean to you that you should avoid heating the hood? A. I never gave any thought to what it means to me because I think it is just drapery.

XQ280. Does that mean to you that the hood should be heated? A. I don't know why it has to 333
mean anything to me.

XQ281. You are not here at my invitation. I am asking you a question. A. I could very well say that it does not mean anything to me, and I would be pretty close to the truth.

XQ282. Since it would not be the entire truth, let me have the benefit of your opinion. A. Will you read it again, please?

(Question repeated by the reporter.)

A. It means nothing to me because I know of no knowledge that indicates to me that that is true.

334 XQ283. My last question is does that mean to you that the hood is not to be heated?

The Court: That is, was that the intention of the patentee?

The Witness: I do not know why it should mean that the hood should not be heated.

The Court: I do not think Mr. Darby's question is whether you agree with that statement but whether that language of the patent means that that is not to be heated.

The Witness: I don't see that it does.

XQ284. Now, I understood you to say, Doctor,
335 maybe I was in error, that in the defendant's structure there is provided no flange for conducting heat from the hood or the cap to the wick tube, is that correct? Did you so testify? A. None specifically designed for that purpose.

XQ285. You understand the function of the flange in the Withrow patent structure? A. I understand what the patent specification implies or attempts to imply. It will receive heat and therefore—

XQ286. It is heat by conduction? A. It would have to be heat by conduction from there in.

336 XQ287. So its purpose is to conduct heat from the heated guard down to the wick tube of the torch? A. Yes, which is unavoidable by any device which is around a wick tube.

XQ288. Now, that function is served in the defendant's structure by means of the metallic part No. 4, is it not? A. It is a result of that structure.

XQ289. In other words, this metallic part 4, through which the holes 6 are cut conducts heat from the heated hood to the wick tube, is that correct? A. Yes, just as all kerosene lamp structures do.

XQ290. And I am referring, of course, to the member marked 4 on Fig. 2, showing the Anthes structure of Defendant's Exhibit B. I am taking that precaution because in our exhibit, Plaintiff's Exhibit 25, they have different reference numerals. A. Yes. 337

Mr. Darby: That is all.

Redirect Examination by Mr. Wisner:

RDQ291. Did I understand you to say on cross examination, Doctor, when you were asked some questions with reference to whether there was any 338
disclosure in the prior art of side flame openings, did I understand you to say the word "flame openings" or "air ports"? A. I think we meant air ports.

RDQ292. That is, you referred to the air port 7? A. Oh, yes, air ports.

RDQ293. Do you wish to correct your testimony in that regard? A. That is what we were talking about, I meant air ports.

RDQ294. That is not what you said, but that is what you had in mind? A. I meant air ports—
not in exact combination with the others. 339

RDQ295. For example, you find side flame openings in the Malcov patent, don't you? A. Yes.

RDQ296. Those flame openings serve for the admission of air? A. Yes.

RDQ297. And that is on the side? A. Yes.

RDQ298. In the operation of Malcov which you observed, what effects did you perceive in reference to openings in the top of the dome? A. I could see no water drop through them.

RDQ299. With reference to soot, what did you observe? A. They sooted up immediately.

340 RDQ300. So in operation the device quickly came to have an imperforate top? A. Yes.

RDQ301. Now I show you Defendant's Exhibit I, the same being a model of Malcov which I have separated int[illegible] its two constituent parts. When you said Mal[illegible] had a wick within two tubes, it was as designed there? (Indicating.) A. That is what we have.

RDQ302. One tube contains the wick? A. And the other tube slips out down over it. I said that the tube containing the wick is on the inside of this structure.

341 RDQ303. The view on Fig. 4 of Exhibit B, is that a side elevation view? A. Part of a side elevation view.

RDQ304. It does not purport to show the two wick tubes? A. No.

RDQ305. I now hand you a copy of British patent to Salsbury, No. 16,524, of 1895. Where do you find air inlets in that particular structure? A. On the sides and the bottom.

RDQ306. In two places? A. Yes.

RDQ307. What was the purpose of that structure? A. To protect the flame from air currents.

342 RDQ308. Where was it used? A. My recollection is it was used indoors.

RDQ309. That is, outside on a carriage, or indoors, or where? A. More or less in closed places, I would call them.

RDQ310. Will you refer to the patent specification and refresh your recollection as to the use described therein? A. Shall I read it?

RDQ311. Just refresh your recollection as to what use it was put to. A. I received the impression it was used indoors because one of the claimed virtues is it burns steadily and is free from smoke.

RDQ312. It refers, however, to carriages, does it 343
not? A. That is, the inside of carriages? I do not know; I do not see.

RDQ313. How would it operate outside? A. It operated very well in the several mile wind when I saw it operating.

RDQ314. Is there any lack of disclosure of imperforate domes or imperforate tops for flares in the prior art? A. No, there are a great number of them.

RDQ315. I hand you Plaintiff's Exhibit 9 and direct your attention to the drawing in the lower
left-hand corner of that exhibit and ask you what 344
you find superimposed above the wick? A. A flat umbrella.

RDQ316. I will ask you to look at the date of that drawing. A. The date on the blueprint is March 24, 1926.

RDQ317. That could be used, could it not, to protect a torch from rain? A. Yes.

The Court: You say that there is nothing in the prior art patents or prior publications reading exactly on claims 2, 5, 11 and 12?

The Witness: As I recall the question, it
described the exact combination. 345

The Court: That is what I say, reading exactly on claims 2, 5, 11 and 12?

The Witness: Nothing that I know of, the exact combination.

RDQ318. That is, with the flame ports and air ports, both, at the side—

Mr. Darby: No, no,—

Mr. Wisner: That is what the witness is talking about.

The Court: Let me have what you have to say about that.

346 The Witness: My recollection is it was one of the earlier claims, and the only point is this, was the fact that it was perforate instead of imperforate with small holes there. I agreed with Mr. Darby on that, and we came to another claim, and I said I will agree, I know of nothing in the prior publications that had side air ports. I understand that I said flame ports, but I meant air ports, and that is agreed, which shows the exact combination. I emphasize "exact combination." I almost have to answer it that way.

347 The Court: I understood you to say there was nothing which showed the exact combination.

The Witness: Not that I know of, the exact combination. It was the side air ports that made me agree with you on that.

The Court: Are you seeking to draw a distinction there? I want to get it clear in my own mind.

The Witness: Well, of course, that covers territory up to then I do not believe was covered—

348 The Court: I do not want to go into detail, I just want to get this clear in my mind.

The Witness: All kerosene devices, what we call kerosene lamps, have their holes down here, that is universal. But there have been all kinds of devices made. I do not say they have been patented, I am not familiar with patents very well. I have seen devices that had this combination, the holes in there (indicating).

RDQ319. You are referring now to Fig. 2? A. Fig. 2. When you have the holes in the bottom, and as the lawyer stated, I thoroughly agreed with

Mr. Darby on the exact combination, and the point 349
was because I was looking out for that word, side
air ports,—

RDQ320. That is, referring to Fig. 1? A. Yes, as used in the Withrow device. That was my contention.

Mr. Darby: All I have to do, Your Honor,
is to take the witness over element by element
and claim by claim and then force him to admit,
as he will be forced to admit, that there is
nothing in the prior art that shows the combination
of any of those claims, and that is
what I propose to do. I haven't any doubt 350
about that.

The Witness: I think that is in the record.

The Court: What?

The Witness: That I agreed with Mr. Darby that in my opinion that perforate, that that claim is not wholly and exactly represented by Malcov, and then I agreed on the others.

The Court: Is there anything in the prior art showing this combination of elements?

The Witness: Not the exact combination;
they may have side air ports. 351

Mr. Darby: Now you limit your answer to side air ports—

The Court: I do not know whether it is your turn now.

Mr. Wisner: I am perfectly willing to have Mr. Darby go on.

The Court: I would like to have you finish first.

Mr. Darby: I will cover it, because three of of the claims do not mention side air ports at all.

352 The Witness: That is the one I was watching, for, in 5, no, not 5, 11, lateral exit of flame and entrance of air, which means the addition of air ports and flame ports. I thought I made it quite clear.

The Court: Were you contrasting "exact" with something else here?

The Witness: No, I am trying to use the term "exact combination" to be that it is exact with it.

The Court: Do you mean there is anything near it?

353 The Witness: Yes, I think there are things near it.

The Court: How far away are they? Let us see.

The Witness: I do not know as I could cite anything out of the great mass of what I have had here. As I have stated several times, I am not very familiar with patents; I am familiar with what is in the literature, the scientific literature, as a rule. But I thought I rather agreed with Mr. Darby that this is not an exact combination of those things because

354 of the pin holes—

The Court: You are referring to Malcov now?

The Witness: Malcov. I agreed that 11 and 12 wasn't there. I agreed with Mr. Darby on that. I know of nothing that has that exact combination in the prior art. It all depends on the definition of "exact."

The Court: What do you mean by that? Let us have your meaning of that.

The Witness: Well, "exact" would mean you would have your air coming in a different

orifice than your flame going out, that would 355
be "exact."

Now, if you cut this out the air ports and
the flame ports are the same. I do not know
whether that would be exact, that is the thing
to argue about; I wouldn't particularly argue
about it. A flame port down here, the air could
come in here like it does in Malcov, and the
flame could come out here. That would be the
natural flow of air, heated air.

Mr. Wisner: May it please the court, be-
fore we go on with further cross examination
of the witness, I have a motion to make con- 356
cerning a matter which only came to my atten-
tion at the close of the hearing yesterday. I
refer to Plaintiff's Exhibits 18 and 25. Next
to the last line it states here: "Side flame
openings 9." The word "openings" is not in
the claim of the patent and I move that from
each of the exhibits it be stricken, or the ex-
hibits themselves be stricken.

Mr. Darby: Your Honor, these exhibits are
for the court's convenience, reciting the ele-
ments of the claim and showing how they are
applied to the structure of the patent, as well 357
as the structure of the defendant.

The Court: I understand they are merely
there for illustrative purposes.

Mr. Wisner: They are slightly more than
that, Your Honor.

The Court: I suppose it is like a brief.

Mr. Wisner: I considered it was an exhibit.

The Court: Mr. Darby, you might state, so
that the record will indicate, the purpose of the
exhibit and to what extent it would be binding.

358 Mr. Darby: If my previous statement does not do so, Your Honor.

The Court: I thought it did but—

Mr. Wisner: Is the statement then that what are labeled claims in this exhibit do not necessarily read like the claims?

Mr. Darby: They are in interpretation of of the claims, pure and simple, with such added words as necessary to make the application of the claim perfectly clear, from the plaintiff's viewpoint.

Mr. Wisner: I simply wanted that particu-
359 lar point clear.

The Court: Now is there any other place besides the word "openings"?

Mr. Wisner: In claim 12, the third line from the bottom, the words "provision for" are not in the claim.

Mr. Darby: In each instance where we thought it would help to make the explanation clear, if we interpreted words, we put it in parenthesis.

The Court: Yes, I notice that.

360 *Cross Examination by Mr. Darby:*

XQ321. You understand in the structure of the patent as illustrated, for example, in Fig. 1 of the Withrow patent as reproduced on Defendant's Exhibit B, that there are restricted openings for air, do you not? A. I do.

XQ322. What are those restricted openings? A. No. 10 below the flame port and in the sides. Of course, they are restricted particularly under the condition of zero wind.

XQ323. How do they restrict the admission of

air? A. Because the hole is an emptiness, not formed of material. 361

XQ324. That is, the holes are relatively small, is that the idea? A. Yes.

XQ325. Now, referring to the Russian patent, Fig. 4, Malcov. Are there similar restricted air openings in the Russian patent? A. Not similar restricted air openings.

XQ326. Are there any restricted air openings in the Russian patent? A. The very presence of this metal means that there is some restriction.

XQ327. Then the restriction is the restriction effected by the size of the flame opening itself? A. 362
Well, I do not say that; I would say by the size of the metal parts rather than the openings, that would govern the restriction.

XQ328. And the limit of the restriction is the peripheral edges of the metal parts which define the flame openings? A. Yes, I would say that. To put it in just ordinary language, the restriction is roughly in proportion to the amount of metal that is present in the circumference.

XQ329. How long have you been with the General Electric Company, Doctor? A. Twenty- 363
seven years.

XQ330. How many? A. Twenty-seven.

The Court: Do you regard Malcov as the best reference here?

The Witness: Of all that there are, it is the best one to analyze all these parts in combination.

XQ331. And you say throughout those entire twenty-seven years you have been with the General Electric Company? A. Yes.

XQ332. Devoting your entire time to their work? A. Correct.

364 XQ333. And throughout those twenty-seven years has the General Electric Company produced commercially or experimentally, to your knowledge, kerosene burners? A. No, but we have been in competition with them, very decidedly originally, so we had to do a lot of work on them.

XQ334. Have you personally done a lot of work on kerosene burners? A. Oh, yes.

The Court: Then it is your position that anyone skilled in the art, having Malcov, could have produced this?

The Witness: Knowing Malcov?

365 The Court: Yes.

The Witness: And in the light of the knowledge that was acquired seventy years later, or whatever the time was, it would have been a good beginning, very good beginning.

The Court: That, of course, does not answer my question.

The Witness: Where we begin we improve.

The Court: I know sometimes we refer to hindsight and foresight, and so on, but what I want to know is, you claim Malcov is your best reference, that is one thing.

366 The Witness: It is the best reference in structure, but not in principle.

The Court: What I want to know is, in your opinion could anyone skilled in the art, having Malcov in mind, have produced this device described in the plaintiff's patent?

The Witness: It would be fair to assume that he has other contiguous and contemporary knowledge, such as the Argand, involving certain principles. If he had that knowledge plus this—

The Court: Plus which?

The Witness: Plus this structure available— 367

The Court: Now you are referring to Malcov?

The Witness: Yes, of Malcov, and knowledge of the principles that had been developed from the time of Argand, he would make a very, I think he ought to make a better one.

The Court: Than what?

The Witness: Than Withrow.

The Court: You have been in this line how many years, twenty-seven years?

The Witness: I have never been in the design of flares or anything of that sort. 368

The Court: Do you know anything about this, whether there has been any effort to improve these flares?

The Witness: The only effort that I know was the rather general typical cut and try method that has been used—

The Court: I may be going both beyond the direct and cross examination.

Mr. Darby: Mr. Wisner and I both welcome that, Your Honor.

The Witness: The only effort I know of is 369
the usual cut and try process. It seems simple, particularly when you start with a primitive light source, it seems hard to remember that there have been so many developments—

The Court: You realize that if there have been developments, that there should be some of it survive that would occur to one skilled in the art.

The Witness: But these things all did occur to others with light sources that they used indoors where they had to get rid of the soot

370 and smoke and nuisance—

The Court: Do you know why they did not use them outdoors before they actually did use them, on the road?

The Witness: The roads have become immensely more important in the last ten years, that is the real reason.

The Court: Of course, they have been used on roads for years, there have been improvements on roads for years before that.

The Witness: But they were not used in the quantities that they have been for the last
371 ten years.

The Court: You think that these have been used for about ten years, about ten years ago they started to use them?

The Witness: Oh, they used them before that, I carried one in a torchlight parade when I was a boy.

The Court: How long have they been using, not in a torch for parades, but instead of red lanterns on the road, how long have they been using them for that?

The Witness: I couldn't say as to that, sir,
372 I have seen them all my life.

The Court: What I am getting at is, with the knowledge of Malcov, why do you think that it wasn't possible that people could have used this and developed this before?

The Witness: Necessity is the mother of invention and development.

The Court: When do you think—

The Witness: These were good enough for casual uses.

The Court: When do you think this demand arose?

The Witness: I think it arose due to the 373
increase in traffic on the roads, the numbers
of trucks and—

The Court: When?

The Witness: It is obvious from the sales that it began to pick up in the last ten years with the great trucking business on the highway and the tremendous amount of road building.

The Court: When was this plaintiff's product produced?

The Witness: I am not sure; about 1929,
was it not? I mean the improvement. 374

The Court: You think it was about the time that the demand arose?

The Witness: Yes.

The Court: Not before then?

The Witness: I think the demand, like all
demands, had a normal growth, the curve
started gradually, and then went up fast, with
all the increased traffic and the necessity of
signals on our highways, and the conscious-
ness of safety and danger, and deaths, and all
that. That caused the demand, and demand is
the mother of invention. 375

Redirect Examination by Mr. Wisner:

RDQ335. Doctor, in your work have you had occasion to concern yourself with highway traffic and safety on highways? A. Oh, yes, from all angles.

RDQ336. Doctor, you were asked some questions by the court about taking Malcov as a precedent and producing the device of the patent in suit. Have you an opinion as to how well that could be

376 accomplished by taking Malcov in the light of Rutz, which is Fig. 3 in Defendant's Exhibit B? A. By lifting Rutz off of that little gasket and putting it on an appropriate kerosene torch, we will say, just as was done here—

RDQ337. Referring to Defendant's Exhibit L. A. Just as was done in Defendant's Exhibit L, providing a flare—

The Court: Is that a new combination of elements?

The Witness: That is taking the whole thing, that whole business, with the exception
377 of the wick and torch body—

RDQ338. Referring to the hood—

The Court: You mean if you take—

The Witness: Take this housing—

The Court: Take Rutz and Malcov together?

The Witness: No, this one alone.

The Court: Alone?

The Witness: Take that off of the gasket.

The Court: Yes.

The Witness: And take a torch, an open torch, with a hole of the right size, and this
378 enclosure that is called for in the Rutz patent, Fig. 3 in Exhibit B, replace this whole thing in a Withrow device. Now, the surrounding flame, wick, burning flame, and you have a flare. The difference now is—

The Court: How would you apply that Rutz to Malcov?

The Witness: I wasn't asked that question.

The Court: You said you would apply the Rutz, you could apply Rutz to what?

The Witness: Malcov is another device entirely.

The Court: I understand Rutz was a gas stove. 379

The Witness: Yes, and you lift it from one purpose to another. If I understand the question correctly, it applied entirely to Rutz.

RDQ339. In transferring the Rutz hood to a torch body do you make any change in its function or operation? A. All the principles of operation remain the same.

Recross Examination by Mr. Darby:

RXQ340. Do you mean just that? There is a difference in the function, is there not? A. The principles remain the same. 380

RXQ341. The function is different, isn't it? A. Oh, yes, sir.

RXQ342. And its operation is different, isn't it? A. I wouldn't say the operation is different.

RXQ343. When it is on a gas stove is it a flare? A. Oh, no.

RXQ344. Is it a light source at all? A. It is, but not an intense light—

RXQ345. You do not see it, do you? A. Oh, yes, I see it. 381

RXQ346. You have to get down and look through those holes to see it. The idea was not to use it as a light, was it? A. No.

RXQ347. So its operation is different as a flare than on a gas pilot? A. I do not say its operation is different. By "operation" I mean how does it operate in here. If you mean its intention, its final purpose, I agree with you sufficiently.

RXQ348. Well, it does not operate to give a flame that is visible from at least 500 feet, does it? A. I quite agree with you.

382 *Redirect Examination by Mr. Wisner:*

RDQ349. But when it is placed down in a torch body, it does operate then to give a flame which is visible at 500 feet? A. That is right.

Mr. Wisner: That is all.

The Court: Do you think that would occur to anyone who was skilled in the art?

The Witness: If he knew this—

The Court: I am talking about someone skilled in the art.

The Witness: Yes; no question about it.

383 The Court: That means he had knowledge of these things?

The Witness: No question about it.

The Court: You think the reason that it wasn't done before is that there was no demand?

The Witness: The principle involved—

The Court: You think the reason it wasn't done before is that there was no demand?

The Witness: Necessity is the mother of invention, and that is what brought about this. Flares became more important, had to be

384 safer with increased speed on the highways, twenty-five million automobiles, and a lot of trucks killing twenty-five thousand people a year.

The Court: You think that only arose ten years ago?

The Witness: The curve growth was obviously the usual curve growth, where crudely it starts slowly and then goes up, and it has increased and resulted in an increase in the use of these flares in the last ten years.

The Court: You think that was only within the last ten years? 385

The Witness: I wouldn't be an expert on that. I would say generally about ten years ago there arose a definite consciousness of safety, and measures of safety had to be taken on the highways that we never had before in the old horse-and-buggy days.

Recross Examination by Mr. Darby:

RXQ350. Just one question more. As I understood your answer to the question, it is your opinion that a man skilled in the art who was seeking 386
to produce a warning flare in a kerosene burner that would withstand gale velocities as high as 40 miles an hour, if he knew of this gas burner of Rutz, that would at once occur to him as being adaptable and usable for the purpose of producing that flare which would withstand gale velocities. Do you mean to testify to that? A. If he were consciously searching for something of the sort that you describe.

RXQ351. And he knew of this? A. And he knew of this. 387

RXQ352. Rutz? A. Rutz.

RXQ353. It is your testimony that that would occur to him automatically? A. Yes, if he was consciously searching for what you describe.

RXQ354. I want to be sure we are talking about the same thing. We are talking about the device which is marked Defendant's Exhibit L, is that right? A. That is right.

RXQ355. And that is the device that you were surprised to find you couldn't blow out with your breath, is that the same device we are talking about? A. Yes.

388 Henry T. Atno, called as a witness on behalf of the defendant, having been duly sworn, testified as follows:

Direct Examination by Mr. Wisner:

The Witness: I am at the present time manager of the Wick Division of the Standard Oil Company of New York. I was subpoenaed as a witness in this case. I have been with the Wicking Division about six years. We sell wicks for use in all forms of oil burning devices. Those wicks are manufac-
389 tured under an operating contract in the hands of William E. Hooper & Sons Company, Baltimore. I am reasonably familiar with the methods of manufacture of wicks. When you refer to capillary lift, those words have a particular significance in dealing with wicks. We regard the phenomenon of capillary lift as the capacity of a substance to lift oil a certain distance against the force of gravity. As to the definite limits on that capillary lift, in our experience we have always tried to hold designers of lamps and other oil-burning devices to a five-inch lift.

390

Cross Examination by Mr. Darby:

The Witness: As to whether there are any definite limits, I would say that the limit would be governed by the height to which capillarity would become effective in combustion. I would say practically that would not be greater than seven inches at the most.

Ray F. Hutt, called as a witness in behalf of the defendant, being first duly sworn, testified as follows: 391

Direct Examination by Mr. Wisner:

The Witness: I live at Fort Madison, Iowa, and am engaged in sales for Anthes Force Oiler Company. I first came in contact with the flare business in May, 1933. Since that time I have been familiar with various state tests. I have visited state testing laboratories and witnessed tests.

Q6. Now, on cross examination the witness Close was asked question 100 as follows: "XQ100. Are any of the states more difficult to qualify a torch in than other states? A. Yes, these states that have a law similar to the one, for instance, in Pennsylvania, are more difficult to pass than other states because of the rigid requirements in the specifications, as noted in my testimony." 392

And also question 101: "XQ101. You characterized Nebraska as one of those states. A. Nebraska is one of those states, because it has practically the same law, the same specifications."

Do you agree with that testimony? A. The specifications of Nebraska are not exactly the same as that of Pennsylvania, but they are both strict specifications. I agree in general. 393

The Witness: To my knowledge, Iowa was the first state to pass the statute for flares to pass tests. Most of the states now require twelve hours. The tendency is in that direction. I am quite sure that the original Iowa tests had no relation to the weather which is customarily found in Iowa.

Q10. Have you recently had occasion to submit

394 any flares to the State of Nebraska for tests? A. Yes, in October of 1937.

The Court: Perhaps you can state what you want to prove, and maybe it will be conceded. I do not know what the point is here.

Mr. Wisner: The point is this, may it please the court:

I offer in evidence as a defendant's exhibit a certificate from the State of Nebraska, qualifying a torch with a torch body disclosed on Defendant's Exhibit L, and with the Rutz structure superimposed thereon, for sale as a

395 flare in the State of Nebraska.

Mr. Wisner: We do not offer the tests as such. We offer first the certificate of qualification. All we seek to show by that document, Judge, is that this flare can be taken out in the State of Nebraska and sold for use on highways.

The Court: For that purpose only will the exhibit be received.

(The paper was received in evidence and marked Defendant's Exhibit M.)

Mr. Darby: Will you pardon my interrup-

396 tion? I would like to have it appear on the record that I believe to be the fact, that it is not the identical device which is here in evidence as Defendant's Exhibit L that was tested in Nebraska.

The Court: Not that identical one, but one similar to it.

Mr. Wisner: Similar in all respects, Your Honor.

The Witness: I was connected with the Anthes Company during the early part of 1934 and the last half of the year 1933, and during that period

we were manufacturing a flare of the type shown 397
in Plaintiff's Exhibit 2. That manufacture was
discontinued and a different sort of a structure was
subsequently manufactured and sold by our company. We had complaints from several sources,
and it was my observation that the body of the container became quite hot and was difficult to handle
after it had been burning for some time. The
thickness of the metal and the amount of fuel that
it contained and the size, with that large flame,
caused this condition, we reasoned, and the burner
was raised above the body and mounted on the wick
tube in order that air might circulate, and so that 398
it was farther away so that the body would not
become so hot. There is some heat in the torch
body now but they can always be handled.

Mr. Wisner: I offer in evidence as defendant's exhibits photographs of testing apparatus identified by Professor Croft on a deposition taken out at Iowa City, Iowa, and offered during the taking of that deposition.

(The photographs were received in evidence and marked Defendant's Exhibits N, O and P.)

Mr. Wisner: Now, with reference to the 399
record in the preceding case, in the Circuit
Court of Appeals, I have only one copy, which
I borrowed from counsel in that case. That
is the only complete copy which he had. Mr.
Owen says that he received only two copies. I
should like very much to offer this copy that
I have, except it has been somewhat marked
up by counsel.

Mr. Wisner: I offer it in evidence.

(The copy of record was received in evidence and marked Defendant's Exhibit Q.)

400 DEPOSITION OF HUBER O. CROFT EXAMINED ON BEHALF OF DEFENDANT AT IOWA, CITY, IOWA, ON JANUARY 18, 1938.

Huber O. Croft, being duly sworn, testified as follows:

Direct Examination by Mr. Wisner:

The Witness: My name is Huber O. Croft, I reside at Iowa City, Iowa, and I am a mechanical
401 engineer, head of the Department of Mechanical Engineering of the University of Iowa. I have been so occupied since 1929. I was employed at the University of Illinois from 1921 until 1927, as instructor and assistant professor of mechanical engineering. And from 1927 to 1929 at Stanford University as associate professor of mechanical engineering. I got my B. S. degree from the University of Colorado; my M. S. degree from the University of Illinois. M. S. is a Master of Science. I have written various articles for engineering publications and have written seven or eight divisions of
402 books edited by my brother Terrell Croft, and wrote the divisions of Heat Transfer and Fluid Flow for the Gas Engineering Handbook published by the McGraw-Hill Company, and just completed a book on Thermodynamics, Heat Transmission and Fluid Flow which will be published by the McGraw-Hill Company probably in May, 1938. I am a member of the American Society of Mechanical Engineers; the Iowa Engineering Society; the Iowa City Engineers Club; the American Association for Advancement of Science, and a Society for Promotion of Engineering Education. I am a

registered engineer under the state laws of Iowa. 403
I have participated in the making of various tests of devices, since 1922, at the University of Illinois, where I assisted in the experimental tests conducted to determine the characteristics of the ventilation tubes for the Hudson River Tunnel. Since that time, I have continuously been doing experimental work of one type or another, running some boiler tests. Much of my experience has had to do with combustion.

I have made tests of devices in connection with this case. We have tested two types of flares, one made by the Toledo Pressed Steel Company, and 404
the other made by the Anthes Force Oiler Company. The flares of the Toledo Pressed Steel Company were purchased from the Sears Roebuck Company in Iowa City. The Anthes flares were obtained from the Harrison Wholesale Company in Chicago, and one which was marked with our No. 2 was obtained directly from the Anthes Company. I have seen the device marked Defendant's Exhibit "G." That is the Toledo Pressed Steel flare which we marked 8B. Our test number 8B, on which we performed a series of experiments. On the top of the flame guard I find stamped "Patent 405
No. 1,732,708." The brass tubing and a glass tube protruding from one side of the flare was not on it when I purchased it. This addition of the copper tubing and glass is to assist us in making tests on this flare at constant kerosene level in the base of the flare. Elmer C. Lundquist added this contraption to the flare. The stamping on the top of the base of the flare reads: "The Toledo Pressed Steel Company, Toledo, Ohio. Toledo Truck Flare."

I have seen the device marked Defendant's Ex-

406 hibit "H." This is the Anthes Flare which we purchased for testing purposes and which we marked for testing purposes, Flare Y. Protruding from one side of this flare is some brass tubing and a glass tube between the two. That was added by Elmer C. Lundquist for the same purpose as the tube I testified was added to Exhibit G. The top of Exhibit H, consisting of the burner dome and cap, has been tagged Defendant's Exhibit J. I direct your attention to the fact that the cup containing the burner cap appears to be split, the entire burner cap and two halves of the burner cup
407 are joined together. That particular fuel guard was in that condition and also the split receptacle was in that condition when I obtained it. With reference to the burner cup attached to contain the cap, that was in the split condition when obtained by me. That particular cup which I have called a receptacle was received by us from Mr. Anthes. The purpose of the split receptacle was to test an identical flare both with the receptacle and possibly the flame guard and without both the receptacle and the flame guard without disturbing the characteristics of the wick.

408 I have seen the device marked Defendant's Exhibit I. That is an Anthes flare which we tested and which for our test purposes we marked Flare Number 2. The copper tube which protrudes from one side of it performs the same function as the copper tube I previously testified about with reference to Exhibit G. These tests of Exhibits G, H and I were conducted in the Mechanical Engineering Laboratories of the University of Iowa. The tests were initiated on December 24, 1937, and they were completed on January 16, 1938. The tests were conducted under my supervision. I am ac-

quainted with Elmer C. Lundquist. Elmer Lund- 409
quist performed the tests, took the majority of the observations. He is in the Mechanical Engineering Department of the University of Iowa.

The objects of these tests were to determine the characteristics of the two types of flares in question. The tests were conducted indoors where still air conditions prevailed and all tests were conducted at night. The tests were conducted at night to prevent interference from outside light sources. Some tests were conducted under conditions of artificial wind. The flares to be tested under wind
velocities were placed 20 feet from the end of a 24- 410
inch diameter duct which was 22 feet long, to which was connected a variable speed fan; to the intake of the fan was connected a 25 foot long intake pipe. In all tests reported, the four flame orifices of the flame guard were so located that two pointed directly up and down stream, and two were perpendicular to the direction of the wind flow. The velocity of wind was determined by a Boyle Velometer. The Boyle Velometer consists of an indicating instrument and an impact tube which was connected to the indicating instrument by means
of a rubber hose. It is my opinion that the Boyle 411
Velometer is one of the most scientific instruments that can be used for low air velocities. I think it is generally conceded to be a most accurate instrument. The apparatus used for the measuring of the illumination of the flares was a Weston Illuminometer. This piece of equipment consisted of two parts, an indicating device calibrated in foot candles, and the light sensitive portion of the instrument which consisted of two circular, active photo-sensitive eyes each 1.65 inches in diameter, pitched 2.15 inches on centers, and which was con-

412 nected to the indicating instrument by suitable wiring. The photo-sensitive eyes of the Illuminometer were mounted in a rotating and supporting arm which was so constructed that it could be rotated about the axis of a flare in order that the illumination at different points around the circumference of the flare could be determined. In most of these tests the illumination readings were taken in a horizontal plane, that is, a line passing horizontally through the flame orifices of the flame guard passed midway between and perpendicular to the eyes of the photo-sensitive device. Readings
413 were taken at 8 points around the circumference of the flare. These points were spaced forty-five degrees apart.

The precautions taken to prevent interference between the arm containing the photo-sensitive cells and the stream of wind current were that the supporting arm for the photo-sensitive eyes was directly upstream from the flame guard. It never was on a line drawn between the aperture from which the wind was emitted and the flame guard of the flare. The minimum length of time of these tests was one hour. During a test six illumination
414 readings were taken at each of the 8 points around the circumference of the flare making a total of 48 separate and distinct readings of the illumination. During the test period of an hour, 48 readings were taken of wind velocity.

Measurements of fuel consumption were made. The amount of fuel consumed was determined by maintaining the kerosene level in the base of the flare constant for any particular test, and the volume of kerosene required to maintain the constant fuel level determined by employing a calibarted burette which, by means of a valve at the

bottom, could admit kerosene through the gage glass, the upper part of the gage glass tube, and which permitted the volume of kerosene used to be accurately determined. A burette is a long glass tube with a spigot at the bottom end and through which the flow of liquid may be controlled quite accurately. The burette is used with the axis of the glass tube in a vertical direction. In order to make any necessary correction for an excess or deficiency of fuel supplied during the test, the flare was weighed both before and after a test and the necessary correction for excess or fuel deficiency determined. I took into account the effect of the capillary lift in the wicks which I used. In order to discard the variable of capillary lift of the two types of flares, we ran most of the tests at the condition of identical distances from the fuel level to the top of the wick tube in both types of flares. When we refer to capillary lift, that simply means the distance between the fuel level and top of the wick tube. The reasons for maintaining a definite fuel level were to discard the possibility of a variable capillary lift in the tests. For all tests the original wick supplied with each flare was charred in order that errors due to splaying and raveling of the wick would not be introduced. The distance between the top of the wick tube and the top of the wick was maintained constant for all tests. In some of the tests this distance was varied in order to determine the effect of the height of the wick above the top of the wick tube. The wicks used in the tests were those supplied with the flares. We made measurements of the wicks. We found that in the Toledo 8B flare the wick diameter was 13/16 inch, and the wick tube diameter was ¾ of an inch; and, in the Anthes Y flare, the wick diam-

418 eter was 21/32 of an inch and the wick tube diameter was 17/32 of an inch.

In some of the tests, the flame guard of the Anthes flare was simply removed by unscrewing and tests conducted with the flame guard removed. This left what we have been referring to as the burner cup or flame guard cup in position. During some of the tests this cup was removed. In the tests which compared the Anthes burner with the flame guard receptacle and without the flame guard receptacle, the split receptacle was used. The split receptacle consisted of the regular Anthes recep-
419 tacle which had been sawed in two halves, using a jeweler's saw, and which could be held in place around the wick tube by a circular wire spring. The flare could, therefore, be tested with the split receptacle in place and, by unsnapping the spring, the split receptacle could be removed without disturbing the condition of the wick. That is the device which has already been identified as Defendant's Exhibit J.

In making these tests we used a kerosene which was purchased from the University storehouse and which had a flash point of 155.1 degrees Fahren-
420 heit as tested in the Cleveland Open-Flame Tester. The specific gravity was 45 degrees, A. P. I., which gave a specific gravity of 0.805 at 78 degrees Fahrenheit.

The term "efficiency" as used in the description of these tests means the ratio of the illumination in foot candles at 12 inches; secondly: the weight of fuel used in pounds per hour. That is, if "I" represents the illumination in foot candles at 12 inches, and "W" represents the weight of kerosene used in pounds per hour; then the efficiency is I over W. In other words, the efficiency compares

what is put into the device in the form of fuel with 421
what is taken out of it in the form of light. The
efficiency usually means the output divided by the
input and, in this case, we are dividing the output
in light by the input in kerosene.

In the first 16 tests the distance from the axis of
the flare to the plane of the photo-sensitive eyes
was 7½ inches; in tests 17 to 46 inclusive, the dis-
tance from the axis of the flare to the plane of the
photo-sensitive eyes was 12 inches. The readings
taken with the photo-cells 7½ inches from the axis
to the flare was corrected to the 12-inch distance by
using the "Inverse Square Law." It is a well 422
recognized law for correction but, of course, only
applies to point sources of light. That means for
those tests which were corrected by this method,
error in absolute values has been introduced, but
for comparative purposes, no error has been intro-
troduced.

The three photographs marked Defendant's Ex-
hibits 34, 35 and 36 (N, O and P) illustrate the flares
and equipment used by us for performing charac-
teristic tests and to show both the Anthes and
Toledo flares. In Defendant's Exhibit O, the cir-
cular table in the lower middle of the photo is a 423
supporting table upon which the flares were tested.
Extending to the left of that table is an arm; upon
the arm is an upright. The extending arm to the
left of the table is the rotating and supporting arm
for the photo-sensitive eyes of the Weston Illu-
minometer. The object protruding from the top of
that arm is the photo-sensitive eyes. At the right,
in Defendant's Exhibit O, there are two glass
tubes, two horizontal tubes and two vertical, one
above the other. The topmost tube is the bottom
of the burette, showing the spigot valve. The

424 lower glass tube indicates the height of kerosene in the base of the flare and was used to maintain a constant kerosene level during the test. The flat table-like object in the foreground of Exhibit P is a flat sheet used to promote parallel flow, horizontal flow, over the flare, and to prevent any undesirable eddies to project themselves over the flare and its supporting table. At the front and upstream edge of this table is shown the impact tube of the Boyle Velometer, by means of which, velocity readings were taken.

We found that the average wind velocity at
425 which the Anthes flare without the flame guard was extinguished was 15.3 miles per hour. In determining that fact, the receptacle which holds the flame guard, as well as the flame guard, was not removed. The split base was on the flare. We made tests to determine at what wind velocity the Toledo Flare would be blown out, its flame guard being removed. We found the average wind velocity at which the Toledo flare, without the flame guard, was extinguished, was 11.3 miles per hour. We made tests to determine what was the greatest wind velocity for each of the two flares
426 with the flame guards in place, what they would withstand. We were unable with the equipment as installed to extinguish either of the two flares. This maximum wind velocity of 33 miles per hour was the maximum we could attain without extensive readjustment of our testing equipment.

Q116. Did you consider there was any object in testing the flares with the flame guards in place at velocities higher than they would be blown out with the flame guards removed? A. It is my opinion that greater wind velocities than this would be of

purely academic interest and, therefore, we did not 427
go to higher velocities.

We made some tests having to do with the effect of wick height on performance. The three graphs marked Figs. 4, 5, and 6 were prepared by Elmer C. Lundquist, under my supervision and direction. These graphs were prepared from test data obtained by Elmer C. Lundquist. I have seen the stenographer's notebook marked Defendant's Exhibit 38. Most of the handwriting in that book appears in the hand of Elmer C. Lundquist. My handwriting also appears in several places. That
is the book into which the readings of these tests 428
were entered. The entries made in the note book were made at the same time the readings were taken. Figs. 4, 5 and 6 are graphs of test data obtained by testing the Anthes Flare No. 2, (Exhibit I). In each of the three graphs the horizontal dimension measures the wick height in inches above the top of the wick tube. The solid line appearing on each of the three graphs indicates tests performed with the flame guard and receptacle in place. The dotted line indicates tests that were performed without the flame guard in
place, but with the regular receptacle in place. 429

Figs. 4, 5 and 6 represent still air conditions. In Fig. 4, the vertical dimension measures of fuel consumption in pounds per hour. In Fig. 6, the vertical dimension measures illumination in foot candles. In Fig. 5, the vertical dimension measures efficiency. In Fig. 4, the three dots on the solid line represent the results of test information, and the crosses in the dashed line represent points obtained from test information. In Fig. 5, the two crosses represent two different tests on two different days under the same controlled condition.

430 The two dots represent the results of two different tests performed under same conditions on two different days. In Fig. 4 is shown that the fuel consumption of the Anthes flare No. 2 is greater with the flame guard and regular receptacle than it is without the flame guard but with the regular receptacle. It also shows that the fuel consumption increases as the wick height increases both with and without the flame guard. In Fig. 6 it is shown that the illumination without the flame guard and with the regular receptacle is greater than the illumination with the flame guard and with
431 the receptacle and, also, that the illumination both with the flame guard and without the flame guard tends to increase as the wick height increases. Fig. 5 indicates that for the Anthes flare without flame guard but with the regular receptacle, the efficiency is higher than for the same flare with the flame guard and receptacle, and, secondly, that the efficiency without the flame guard tends to decrease as the wick height increases and that the efficiency with the flame guard tends to increase as the wick height increases.

The three graphs marked Figs. 7, 8 and 9 were
432 prepared by Elmer C. Lundquist under my supervision and direction from the test data contained in Exhibit 38. The points, whether they be crosses or dots, appearing on each exhibit have the same significance, were obtained in the same manner and represent test data, as I testified with reference to previous Figs. 4, 5 and 6. These graphs have to do with Figs. 7, 8 and 9 which are drawn from test data obtained on the Toledo flare marked by us No. 8B and identified herein as Exhibit G.

The tests represented in Figs. 7, 8 and 9 were run in still air. In each of the three figures, the

horizontal dimension measures wick height in inches. In Fig. 7, the vertical dimension represents fuel consumption in pounds per hour. In Fig. 9, the vertical dimension measures illumination in foot candles. In Fig. 8, the vertical dimension measures efficiency. In Fig. 7, these curves indicate that for the still air condition the fuel consumption is greater without the flame guard than with the flame guard and, secondly, that the fuel consumption without the flame guard tends to increase as the wick height increases, and that the fuel consumption with the flame guard tends to remain constant as the wick height increases. In 433
Fig. 9 it is shown that in the still air condition, the Toledo burner 8B, the illumination in foot candles is greater without the flame guard than with the flame guard, and, secondly, that the illumination without the flame guard increases with the wick height while with the flame guard the illumination remains constant as the wick height increases. With reference to the degree of illumination shown in Fig. 9, with the flame guard the illumination was extremely small. 434

In Fig. 8 are shown the variations of efficiency of the Toledo burner 8B without the flame guard and with the flame guard, and, secondly, that the efficiency without the flame guard tends to decrease as the wick height increases, while the efficiency of the same burner with the flame guard tends to remain constant as the wick height increases. 435

The three graphs marked Figs. 10, 11 and 12 were prepared by Elmer C. Lundquist under my supervision and direction from data contained in Defendant's Exhibit 38. These figures represent test points obtained on the Anthes Y flare (Exhibit

436 H) at variable wind velocities. Except for the split receptacle on Defendant's Exhibit I, and the absence of the split receptacle on Exhibit H, I having been identified by me as No. 2 and H as No. Y, I did not find any differences in the two flares. Referring back to Figs. 10, 11 and 12, in each of the three exhibits the horizontal dimension measures the wind velocity or air velocity in miles per hour. In each of these exhibits the solid line represents test points for the Anthes flare Y with the flame guard and split flame guard receptacle. The dashed line represents the same for the case without the
437 flame guard but with the split flame guard receptacle. The dotted line represents similar tests for the flare without the flame guard and without the split flame guard receptacle. That is true of each of the three graphs.

In Fig. 10, the vertical dimension measures fuel consumption in pounds per hour. In Fig 12, the vertical dimension measures illumination. The two dots on Fig. 12, at about 4.6 miles per hour, represent test points obtained on two different days under the same conditions. The line has been drawn relatively between them. In Fig. 11 the ver-
438 tical dimension measures efficiency. In Fig. 10 the solid line indicates that for the case with the flame guard and split flame guard receptacle, the fuel consumption increases to a point at approximately two miles per hour, then decreases to a point approximately five miles per hour and then increases again to a point approximately eight and a half miles per hour. The dot-dash line representing tests made with the split receptacle on but the flame guard off indicates the same tendencies. With reference to the tests when the flame guard and

its receptacle were both removed, the same tenden- 439
cies are indicated.

In Fig. 12 the solid line indicates that the Anthes
flare Y, the illumination increases from the still air
condition up to a point of about 2 miles per hour,
then decreases to a point at about 5 miles per hour,
and then increases again to a point about 8½ miles
per hour. The dot-dash line for the case without
the flame guard but with the split receptacle shows
somewhat the same characteristic, and, for the case
without the flame guard and without the split re-
ceptacle, that is the dash line, the illumination de-
creases from the no-wind velocity up to approxi- 440
mately 4½ miles per hour and then tends to re-
main constant up to a wind velocity of about 8½
miles per hour.

In Fig. 11 is shown that the efficiency with the
flame guard and with the split flame guard recep-
tacle, it tends to decrease from the still air con-
dition to about 5 miles per hour and then tends to
increase to a point of about 8½ miles per hour.
The dot-dash line without the flame guard but with
the split receptacle shows a decreasing tendency
from the still air condition, and the dash line for
the case without both the flame guard and split re- 441
ceptacle indicates a decreasing tendency up to a
velocity of about 8½ miles per hour. The most
efficient device under still air conditions was the
case without the flame guard but with the split re-
ceptacle. The least efficient device under still air
conditions was the case with the flame guard and
with the split flame guard receptacle. At air veloci-
ties greater than approximately 1 mile per hour,
the flare with the flame guard and with the split
flame guard receptacle was the most efficient.

The three graphs marked Figs. 13, 14 and 15, re-

442 spectively, were prepared by Elmer C. Lundquist under my supervision and direction from data contained in the notebook which has previously been identified as Defendant's Exhibit 38. These figures show test results obtained from the Toledo flare 8B. That is the same flare which has been heretofore identified on this hearing as Defendant's Exhibit G. These tests depicted in these figures were conducted both in still air and at variable wind velocities. The horizontal dimension on each of the exhibits measures the wind velocities. In Fig. 13, the vertical dimension measures fuel
443 consumption in pounds per hour. In Fig. 15, the vertical dimension measures illumination in foot candles. The vertical dimension in Fig. 14 measures efficiency. In each of the three exhibits the solid line represents the Toledo flare with the flame guard in place. The dotted line indicates the Toledo flare without the flame guard. On each of the three exhibits the dots in the solid lines and the crosses in the dotted lines indicate test points obtained from testing these flares. In Fig. 13 is shown that the fuel consumption in pounds per hour of the Toledo flare with the flame guard was
444 greater than that of the same flare without the flame guard at velocities approximately greater than 1 mile per hour, and that in still air conditions the fuel consumption of the Toledo flare without the flame guard was greater than the same flare with the flame guard. Fig. 15 indicates that the illumination of the Toledo flare with the flame guard is greater than the illumination without the flame guard at air velocities of approximately 1½ miles per hour, and greater, and that at the still air condition, the illumination without the flame guard is greater than the illumination with the

flame guard on the same flare. In Fig. 14 is shown that our tests on the Toledo flare No. 8B, the efficiency without the flame guard is greater at all points than the efficiency with the flame guard on the same flare. That was true in both still air and in conditions where air velocity was present. 445

We made tests to determine what effect, if any, the variation in the height of the fuel in the reservoir might have on performance. Figs. 16, 17 and 18 were prepared by Elmer C. Lundquist under my supervision and direction, under data taken from tests and recorded in the book heretofore identified as Defendant's Exhibit 38. These figures represent test data obtained on the Toledo flare 8B, the same flare which has been heretofore identified as Defendant's Exhibit G. In each of the three figures the horizontal dimension measures the fuel level recession. The fuel level recession is the distance from the top of the wick tube to the kerosene level in the base of the flare. The distances of 1⅛ inches, 2⅛ inches, and 3⅛ inches below the top of the wick tube were taken in these tests. The tests shown on Figs. 16, 17 and 18 are tests having still air conditions. In Fig. 16 the vertical dimension measures the fuel consumption in pounds per hour. In Fig. 18 the illumination in foot candles is measured by the vertical dimension. In Fig. 17 the efficiency is measured by the vertical dimension. Fig. 16 shows that for the Toledo No. 8B flare, the fuel consumption in still air with the wick height of ⅜ of an inch was greater without the flame guard than with the flame guard for all tests, and, secondly, that the fuel consumption tends to decrease with fuel level recession for the flare, both without the flame guard and with the flame guard. 446 447

448 In Fig. 18 is shown that our test points indi-
cate that the illumination without the flame guard
in still air and having a wick height of ⅜ of an
inch, was greater without the flame guard than
with the flame guard and, secondly, that the illumi-
nation without the flame guard tends to decrease
with the fuel level recession and also that the
illumination with the flame guard remaining con-
stant as the fuel level recession was increased.
In Fig. 17 are shown that our tests indicated that
the efficiency of the Toledo flare 8B in still air and
with the wick height ⅜ of an inch is greater with-
449 out the flame guard than with the flame guard, and,
secondly, that the efficiency without the flame guard
tends to decrease and increase slightly as the fuel
level recession increases and that with the flame
guard the efficiency is practically constant as the
fuel level recession increases. On Figs. 4 to 18,
both inclusive, the initials HOC are in my hand-
writing, and the initials ECL are in Elmer Lund-
quist's handwriting. In connection with the tests
about which I have testified, observations were
made with reference to wick consumption. We de-
termined that within the period of greatest use of
450 the flares, continuously burning, which is a six-
hour period, that it was impossible to detect any
consumption in the wick by measurement with a
rule. This was true for both the Anthes and Toledo
types of flares. In our measurements with a rule
in attempting to determine whether there was any
wick consumption, or not the nearest 1/120th of
an inch could be estimated with the flame guard in
position, and with the flame guard removed.

Q213. With the data obtained by you and Mr. Lundquist from the tests about which you have just been testifying, and the graphs of performance as

they were prepared, will you state what conclusion, 451
if any, you have reached with reference to the performance of the Toledo flare when the flame guard was in place as contrasted to its performance when the flame guard was removed? In connection with this question I hand you the series of graphs to which you may refer if you so desire. A. We found that for the Toledo flare No. 8B, that the efficiency without the flame guard was greater than it was with the flame guard as shown in Fig. 8, or the still air condition; and, that the same thing was true at variable wind conditions as shown in Fig.
14. That the illumination as shown in Fig. 9 was 452
greater without the flame guard than with the flame guard for the still air condition, that at velocities of approximately 1½ miles per hour the illumination with the flame guard was greater than without the flame guard.

That was Fig. 15. That was at variable wind velocities greater than 1½ miles per hour. And, that the fuel consumption as shown in Fig. 13 was greater with the flame guard than without the flame guard for approximate wind velocities greater than 1 mile per hour. That in Fig. 7 the fuel consumption was greater without the flame guard than with 453
the flame guard at variable wick heights, under still air conditions. And, that in Fig. 9 the illumination without the flame guard was greater than it was with the flame guard at variable wick heights under still air conditions. That the efficiency as shown in Fig. 8 in still air conditions was greater without the flame guard than with the flame guard for variable wick heights. In Fig. 16 the fuel consumption without the flame guard was greater than it was with the flame guard at variable kerosene levels, in still air conditions. And,

454 in Fig. 17 the efficiency was greater without the flame guard than with the flame guard as the kerosene level decreased in still air. And, in Fig. 18, that the illumination without the flame guard was greater than with the flame guard in still air conditions as the fuel level decreased. In connection with the making of these tests we informed ourselves as to the average wind velocities throughout the continental United States. We found by referring to the 13th Edition of the American Society of Heating and Ventilating Engineers' Guide, 1935, on pages 136 and 137, a table which
455 shows the average wind velocities at specified points in all states of the Union and Canada for the heating season, and in this we find that the maximum average wind velocity has been found at Buffalo, New York, and is 17.7 miles per hour, and that the minimum average wind velocity condition is found at Lander, Wyoming, and is 3 miles per hour.

Q221. Referring again to the tests, Professor Croft, will you state what conclusion, if any, you reached with reference to the performance of the Anthes flare with a flame guard in place as con-
456 trasted to its performance without the flame guard in place, or with simply the cup for the flame guard in position? A. The performance of the Anthes Y flare with and without the flame guard receptacle is shown in Figs. 10, 11 and 12 and shows that the fuel consumption as shown in Fig. 10 is greater without the flame guard but with the split flame guard receptacle than it is without the flame guard and without the split flame guard receptacle for velocities greater than approximately 1½ miles per hour, and that at the still air condition, the consumption without the flame guard and without the

split flame guard receptacle is greater than with 457
the flame guard but with the split flame guard receptacle. Fig. 11 shows that our test results indicate that for the Anthes burner Y, the efficiency without the flame guard but with the flame guard receptacle, is higher at the still air condition than it is without the flame guard and without the split receptacle. That these two above curves intersect and cross at velocities of approximately .6 miles per hour and 2½ miles per hour, and that for velocities greater than 2½ miles per hour the efficiency without the flame guard but with the split receptacle is greater than without the flame guard 458
and without the split receptacle. Fig. 12 indicates that the illumination in foot candles in still air of the Anthes Y flare is greater without the flame guard and without the split receptacle than it is without the flame guard but with the split receptacle. This is true up to a velocity of approximately 2 miles per hour, and the reverse is true at higher velocities than approximately 2 miles per hour.

Q222. With reference to the same Exhibits, what conclusion did you reach with reference to performance with the flame guard as contrasted to the 459
two other conditions shown on the graphs when the flame guard has been put in place as contrasted to the entire absence of a flame guard and split receptacle, or the presence of the split receptacle only, what is true about the performance? A. The use or the addition of the flame guard to the receptacle increased the illumination at velocities greater than roughly .5 miles per hour, and lowered the illumination at the still air condition, as shown in Fig. 12. In Fig. 11, the addition of the flame guard to the receptacle increased the effi-

460 ciency at the velocities approximately greater than 1 mile per hour, and at the still air condition decreased the efficiency. In Fig. 10 the addition of the flame guard increased the fuel consumption at perceptible velocities, but, at the still air condition, decreased the fuel consumption under that of the flare without the flame guard and without the split flame guard receptacle, but increased it above that at the still air condition of the flare without the flame guard but with the split flame guard receptacle.

I have seen a copy of Patent No. 1,732,708,
461 marked Plaintiff's Exhibit 1. I have examined it and compared it with the Anthes structures as exemplified in Defendant's Exhibits H and I. I find several differences in construction between Exhibit H and I and the Figure 1 of the patent noted. First: That the flame guard receptacle of the Anthes burner is elevated at approximately ½ inch distance above the body of the flare. Such construction is not indicated in Figure 1 of the patent noted. Secondly: I notice the location of the air ports in the Anthes burner are at the base of the flame guard receptacle while in the Figure
462 1 patent drawing the air ports are in the fuel guard itself. Third: That in Figure 1 of the patent drawing there is a hemispherical shaped member marked 11 in the patent drawing which is completely absent from the Anthes burner. In Figure 3 of the patent drawing I find again the difference in air port location as in Figure 1, and, secondly, that in Figure 3 of the patent drawing there is a wick tube extension marked 11a, 12a, which is totally absent from the Anthes burner. By referring to Fig. 11, representing tests on the Anthes Y, and Fig. 14 on the Toledo flare 8B, I find that

the performance characteristics of these two types 463
of burners are very different. In Fig. 11 is seen that the efficiency of the Anthes burner decreases from the still air condition down to a wind velocity of approximately 5 miles per hour, then increases until a velocity of about $8\frac{1}{2}$ miles per hour is attained, while in the Toledo flare No. 8B, the efficiency increases from the still air condition to a maximum point of about 5 miles per hour and then decreases to a point at about 9 miles per hour.

I find that at perceptible wind velocities, addition of the flame guard to the Anthes flare results in
increased efficiency, while in the Toledo flare 8B, as 464
shown in Fig. 14, the addition of the flame guard decreases the efficiency. It is my opinion that the difference in performance of the two flares can be accounted for by the difference in construction of the two flares. That is, in the Toledo flare, the wick and flame guard are adjacent to the top of the body of the flare and the air ports are in the flame guard, the sides of the flame guard, while in the Anthes flare the wick and receptacle are elevated above the body of the top of the flare and the air ports are at the bottom of the flame guard re-
ceptacle. 465

In referring to Fig. 14, it is quite apparent that the addition of the flame guard to the flare without cover has reduced the efficiency.

In Fig. 13 is shown that the fuel consumption has been increased by the addition of the flame guard for velocities approximately greater than 1 mile per hour. In the still air condition, the fuel consumption has been decreased.

In Fig. 15 is shown that the addition of the flame guard to the unguarded flame of the Toledo flare 8B has resulted in an increased illumination at

466 velocities approximately greater than 1½ miles per hour, and that at the still air condition the addition of the flame guard reduces the illumination.

Q238. Now, directing your attention to the specifications of Patent 1,732,708, Plaintiff's Exhibit 1, and particularly to lines 93 to 96 on page 1 of the specifications, reading as follows: "With the above described construction and arrangement, the oil consumption is materially decreased." From the tests of this device which you made, did you reach a conclusion as to the truth or falsity of that statement? A. We found that for the still
467 air condition, the addition of the flame guard to the uncovered flame of the Toledo flare resulted in a reduced fuel consumption, but, at velocities higher than approximately 1 mile per hour, the addition of the flame guard to the open flame of the Toledo flare resulted in an increased fuel consumption.

We found that as shown in Fig. 9, that in the still air situation the illumination of the Toledo flare 8B was extremely low, and that adding the flame guard to the open flame decreased the illumination enormously. It is my opinion that the increased
468 consumption in fuel at wind velocities of approximately 1 mile per hour, as shown in Fig. 13, is due primarily to heat transmitted to the base of the flare by conduction, and that the heat so transmitted to the top of the flare body and the wick tube vaporized the fuel arising in the wick tube, thereby assisting the natural evaporation process.

The efficiency of a flare consists not only in the vaporizing of fuel properly but in also inducing a proper amount of air at the proper temperature and at the proper place.

Cross Examination by Mr. Owen: 469

The Witness: These flares are used for warning signals on the highways to warn motorists of trucks in distress and they might be used for warnings of openings in pavements or something like that. At night, of course. When I made the tests to which I have referred, I knew what these flares were used for. I had information regarding the requirements of the various State Highway Departments as to the tests which flares must be able to pass in order to be adopted and used as flares. I had two publications, I think, which gave 470
the specifications and requirements for truck flares. I don't believe it is for the State of Iowa. I might have, I forgot which states they are. No one instructed or directed me as to the character of the tests which I was to make. Knowing the requirements of the state highway departments I proceeded to outline and conduct these tests on my own responsibility. I knew, from reading these requirements to which I have referred, that there was also a rain test which flares must pass before they could be approved for use on the public highways. I made no effort to conduct any rain tests. 471
I do not recall whether the pamphlets which I saw required a rain test. I suspect they did. I did not know that the requirements of the State of Iowa, at the time I made these tests, included a test at 40 miles per hour of wind velocity. I stated that our testing apparatus was capable of developing a wind velocity of 33 miles per hour. I stated that both the Toledo and Anthes torches, Exhibits G and H and I, remained lighted at our maximum wind velocity of 33 miles per hour. In these graphs which I have produced, we stopped all or prac-

472 tically all of our tests at about $8\frac{1}{2}$ miles per hour. I decided the tests should not be carried beyond that point. I referred to an engineers' handbook showing an average wind velocity at various points. That handbook does not contain any data regarding the maximum and minimum velocities at the points for which the averages are given. The table indicates that these average wind velocities were compiled from Weather Bureau records, and I suppose that means at the city indicated here in this list. I would assume that these averages were obtained over a long period of time by taking the
473 wind velocities at given time intervals, adding all the wind velocities together and dividing by the time interval. And the result is the average given in this table. This data on pages 136 and 137 of this handbook was made up for the use of heating engineers in determining the radiation for heating houses. What they were interested in was the average wind velocity rather than maximums and minimums.

I did not receive any instructions from Mr. Wisner or Mr. Anthes or others as to the wick extension I was to use in making these tests. I do not
474 know what the practice is or has been with respect to wick extension in the open flame burner, that is, a burner without flame guards. I assumed nothing as to wick exposure. We merely ran the tests under conditions indicated. It seemed to us that the maximum wick height of $\frac{3}{8}$ of an inch was a reasonable wick height with the flame guard in place. We varied the wick height merely to determine the effect of wick height, at the range of wick heights tested, to determine whether wick height was a variable.

XQ27. Did you assume that the same wick ex-

posure would be appropriate under conditions of 475
actual use for flares equipped with flame guards
and flares which were not so equipped? A. It was
my opinion that the devices tested were not flares
without protection, and our tests, in my opinion,
have nothing to do with unprotected—types of un-
protected flares. My tests and my testimony can-
not be assumed to mean or to indicate that an un-
protected flare would be usable as a warning signal
or as a flare.

XQ29. You wouldn't recommend to Mr. Anthes
or anyone else, the manufacture and sale of an un-
protected flare, would you, for use as a warning 476
signal? A. I cannot answer that question defi-
nitely. Under certain conditions I might recom-
mend a manufacturer undertake to manufacture
unprotected flares.

XQ30. But not for use as warning signals on
public highways? A. It is quite even possible I
might suggest that. That is, I can conceive of a
flare which is unprotected which might be suitable
for the highway.

XQ31. But it would not be one of these before
the court? A. I have never thought of that ques-
tion. I wouldn't care to express an opinion. 477

XQ32. To be specific, would you recommend to
Mr. Anthes or to any other manufacturer who
asked your advice, that any of the flares which you
have under consideration today, be sold for use as
warning signals without the flame guard? A. It
is quite possible that flares of that type might not
be salable, but, before I would recommend to any
manufacturer whether he should manufacture that
type of flare, I would consider the question as to
whether that type of flare was salable for highway
protection.

478 XQ33. From your knowledge of the require-
ments prescribed by the highway departments,
would you say that one of the flares which you
have had under consideration today would be
usable without the flame guard? A. I have no
knowledge.

My information relative to state requirements
for highway flares is extremely limited, but that
doesn't preclude my ability to determine the char-
acteristics of these two flares as indicated in the
testimony. The Toledo wick, assuming that it is
13/16 of an inch in diameter, will have approxi-
479 mately 25% greater evaporating area than the
Anthes wick, assuming it is 21/32 of an inch in
diameter. The Toledo wick would not necessarily
give a correspondingly larger flame. The size of
the flame would be a function of both the wick diam-
eter, that is, a function of the evaporating surface,
and also the accessibility of air to the evaporating
kerosene.

The term "luminescent" as applied in claim 11
of the patent in suit to the flame, indicates, to my
mind, that the flame is visible to the naked eye.
Luminosity has to do with the source of light and
480 illumination has to do with the light receiver or
surface to which the light is propagated. I would
think luminosity means visibility. In a general
sense illumination means visibility. In technical
language, luminosity is the amount of light emitted
by a source, point source, expressed in candles.
Illumination is the amount of light received by a
surface and expressed in foot candles.

The luminosity of a flame does not necessarily
increase with the illumination resulting from that
flame. Luminosity might increase more or less
than the illumination. The irregularity of a flame

would affect its luminosity and its illuminating 481
qualities in the same way. The visibility of a flame
from a distance would increase or decrease in ac-
cordance with the increase or decrease of illumina-
tion resulting from that flame, provided the eye
and the illuminated surface were at the same dis-
tance away from the flame.

Referring to the question of wick exposure, if
I wished to produce a flame of the same size in
the Toledo and Anthes torches, taking into consid-
eration the difference in the sizes of the wick, the
natural thing to do would be first to try and in-
crease the diameter of the wick in the Anthes 482
burner. Assuming that the sizes are fixed, as I
have given them:

At no wind velocity, the question is hypotheti-
cal, as the illumination in all cases for the Anthes
burner Y. as exhibited in Fig. 12, is already
greater than that shown in Fig. 15; in all cases,
both with and without the flame guard, that con-
dition apparently prevails until a velocity of ap-
proximately .6 mile per hour is attained for the
case without the flame guards. Above this veloc-
ity without the flame guards, the question is an-
swerable, and it is my opinion that lowering the 483
receptable of the Anthes burner and fastening it
to the top of the burner base would increase the
fuel consumption and possibly the illumination.
With the flame guard, and above the velocity of ap-
proximately 2 miles per hour, the illumination
given by the Toledo flare with the flame guard
again becomes greater than that of the Anthes flare
and the illumination of the Anthes flare might be
increased by again moving the receptacle of the
Anthes flare down to the top and fastening to the

484 top of the base of the flare and drilling the air ports in the side of the flame guard.

By far the biggest majority of our tests were conducted at 3/8-inch wick heights. These observations were obtained under those conditions. The circular and instruction sheet which I produce, marked Plaintiff's Exhibits 4 and 5, were in the box with the Toledo flares which I purchased. I think I glanced at these hastily before I made the tests: I didn't read them with any particular care. This paper which I produce, marked Plaintiff's Exhibit 6, is a paper similar to the one which came
485 with the Anthes torches.

Redirect Examination by Mr. Wisner:

The Witness: With reference to the tests which we were conducting, we were not seeking to determine whether any of the torches which we tested satisfied any requirements of highway commissions and the qualification of torches. That particular question was quite foreign to the determining of the performance characteristic of the two different types of torches. In making the tests about which
486 I have testified, I did not make any observation of wind velocity at more than 10 miles per hour. May I make a correction? The test for extinguishing the burners both with and without a flare cap were made at velocities greater than 10 miles per hour. The performance tests at variable velocities were all conducted at velocities lower than 10 miles per hour. The reason these tests were conducted below a velocity of 10 miles per hour was because at a slightly higher velocity one of the flares was extinguished without the flame guard, and, since we were interested in determining the performance of

these flares with and without the flame guard, we 487
felt it was useless to continue testing at velocities above which one of the flares was extinguished without the flame guard. On cross examination, with reference to an open flame torch, I was interrogated about what the practice has been with respect to wick extensions above the wick tubing in open flame guards. I am not aware that there has been any practice with respect to that. From the tests I made I did not form an opinion of the proper height at which the wick should be extended in testing a flare without a flame guard.

The reason 3/8 of an inch wick height was se- 488
lected for the majority of these tests was because we found that with this wick height for both the Anthes and Toledo flares, the illumination without the flame guard in still air was practically the same as shown on Fig. 6 and Fig. 9, roughly at an illumination of 3 foot candles. In other words, if we start with both flames unguarded and we find at 3/8 of an inch wick height, both flames have or render approximately the same illumination with the same wick height, we at least have one condition at which the variable of wick height may be discarded
for the uncovered flame. Since there are a large 489
number of variables possible in testing any one flare it is necessary in order to get comparative results to obviate as many variables as possible. In the case of wick height, we maintained it at 3/8 of an inch and because of this, had nearly identical performance of both uncovered flames. We maintained the kerosene level for the majority of tests at 1 1/8 inches below the top of the wick tube. Obviously, had we not kept the kerosene level constant for the majority of the tests, another variable would have been introduced. We do not know from

490 our tests that $1\frac{1}{8}$-inch kerosene level is the best operating level for both flares. However, in our test work, if we kept the kerosene level at this condition, we have at least obviated the necessity of correcting for this particular variable on the majority of our tests. We were interested in determining the difference in operating characteristics of two types of flares, not the most efficient operating condition for either type of flare, in the hopes that if such operating characteristics were found to differ, that naturally there must be some difference in the fundamental dimensions of the two
491 types of flares. As to whether or not one of these flares which I tested with the flame guard would be acceptable under the requirements established by the various highway commissions or by the other authorities passing on the qualifications of flares, in testing these unprotected flares, I was not seeking to determine whether either of them would meet any such qualifications.

If the Weston illuminometer were placed on top of a desk over which was a desk lamp, it would indicate in the neighborhood of approximately 10 foot candles. If it were placed on the center of a
492 floor in a relatively well windowed room in the day time, it would indicate approximately 3 foot candles. I was asked a question phrased approximately as follows: "Would the irregularity of a flame affect its luminosity and its illuminating qualities in the same way?" In my answer to that question, I understood the word "irregularity" to mean fluctuation in the luminosity of the flame, I was thinking of a waver in a fluctuating light source.

Recross Examination by Mr. Owen: 493

The Witness: In the tests I made of the Toledo and Anthes burners without the flame guards and in which the flames were extinguished at approximately 11 and 15 miles wind velocity on the average burners, the wick extensions on both burners for the extinguishing test was ⅜ of an inch.

DEPOSITION OF ELMER C. LUNDQUIST EXAMINED ON BEHALF OF DEFENDANT AT IOWA CITY, IOWA, JANUARY 18, 1938

494

Elmer C. Lundquist, being duly sworn, testified as follows:

Direct Examination by Mr. Wisner:

The Witness: My name is Elmer C. Lundquist.
My legal residence is Moscow, Idaho. At the present time I am taking graduate work in mechanical
engineering at the University of Iowa, and I hold
a reserve assistanceship in mechanical engineering
in that institution. I participated as observer in
a series of tests made on the Anthes and Toledo 495
flares, heretofore identified by Professor Croft as
Defendant's Exhibits G, H and I. The average
run was of one hour's duration in each case. In
those tests no readings were recorded or observed
before the flare had burned six minutes.

I have seen the document marked Defendant's Exhibit 38 for identification. The majority of the portions of the document are in my handwriting. The entries that appear therein were made during the course of the tests. The entries representing the readings of the test by the Weston illumino-

496 meter and Boyle velometer were made approximately simultaneously with the taking of the readings. I prepared the series of graphs which have been marked Figs. 6 to 18, both inclusive. I computed points on these graphs from data taken from this day book identified as Exhibit 38. In the case of those graphs showing the various variables plotted against wind velocity, each point represents 96 readings of the instruments. In the cases of still air, the test run with still air, I made 48 observations of illumination with the exception of two or three cases where the Toledo flare No. 8B
497 with the flame guard, and in those cases I made only 24 observations of the Western illuminometer during the hour. By referring to Fig. 9, the case of the line showing the results for the Toledo flare 8B, giving illumination for different wick heights, it will be noticed that the illumination was very low, approximately 6/100 of a foot candle. For this reason, due to the fact the reading was very low, the Weston illuminometer did not fluctuate a great deal, didn't fluctuate enough to be noticeable. That being the case, I thought it would be suitable only to take 24 readings instead of 48 as I had
498 done in the other tests.

I have previously participated in the making of tests and reduced the data obtained from those tests to the graphical form. I filled in the curves as they appear on these graphs. In my opinion the curves were filled in with accordance with the standard engineering practice. Each point fixed on the graphs was arrived at by averaging the values obtained from the test. For instance, during those cases where I took 48 velocity readings during the hour, I added these 48 readings together and divided by 48, and that was the average value used

to plot these curves. A similar method was used 499
with the other measurements taken. I made the calculations. To the best of my knowledge the calculations are true and correct. Referring to Exhibit 38 for identification, the entries I made in there in my own handwriting to the best of my knowledge, these entries are correct and true.

PLAINTIFF'S REBUTTAL

ROBERT A. CURRIE, called as a witness on behalf of the plaintiff, in rebuttal, having been duly sworn,
testified as follows: 500

Direct Examination by Mr. Darby:

The Witness: I reside in Syracuse, New York; I am fifty-eight years of age, and am connected with The R. E. Dietz Company. I am works manager of their factories. I have entire charge of all the production of the Dietz Company. The Dietz Company is the largest manufacturer of lamps and signal lamps in the United States. They are the oldest company engaged in the manufacture of that
type of product in the United States. The business 501
was founded in 1840. I have been with that company since 1903.

Up until about 1923 or 1924, or thereabouts, our company made and sold lanterns for signal purposes, warning purposes. The ordinary tubular lantern with red globes. The company subsequently engaged in the manufacture and sale of a flare of the torch type. Our engaging in that manufacture was occasioned by the fact that the torch which had been on the market by the Toledo people about a year, and that was the reason we went

502 in the business. We did not want to go into the manufacture of torches and flares, we put it off for a year. We were compelled to do so by the loss of sales and the requests we were receiving from our jobbers for a light article. When we decided to go in the business of manufacturing a flare or torch, the first step that we took in that direction was to obtain one of the open wick type Toledo torches. That was a type exactly similar to Plaintiff's Exhibit 10. That is what was on the market at that time. It was competition from these devices that caused us to go into the question.
503 After I obtained this Toledo torch I experimented with it for the better part of that year, the year 1928, I think it was. The purpose of my experimentation was that we first wanted to substantiate the claims made by the Toledo Company and see if we could find any flaws in them, and I felt that sooner or later we would have to go into that same business, so I wanted to be prepared.

As a result of my experimentation with the open wick type of torch of the Toledo Company, like Plaintiff's Exhibit 10, I found they used a great deal of oil. I found they were not weatherproof,
504 particularly in rain, and they would not stand up against winds unless the wick was raised considerably above the burner. At about ½-inch wick extension above the burner it would withstand about 35 miles an hour. If you raise it up about 2 inches it would perhaps stand a 40 mile an hour wind. I can say that it would.

The Court: How about rain?

The Witness: It would not stand up in heavy rain. There was nothing to protect it at all.

In determining to bring out a device ourselves we

were endeavoring to produce one which would overcome those defects in the Toledo torch. And that experimentation over that year's period of time included efforts on our part to improve on the open type Toledo torch. I had charge of that work. It was continuous and extensive throughout the better part of that year. 505

I have about 14 inventions to my credit. Patented inventions. I have three pending applications for patents.

I have a Thatcher gas range in my home, made over here in Newark, New Jersey. I am familiar with the pilot light cap on that stove. It is the 506 same thing as the one attached to Defendant's Exhibit L. In 1928, I was familiar with the type of cap on my gas stove. We moved into our present house in 1922, so at that time I must have been acquainted with that fully six years. I have the same stove and have had throughout that period. I had personal familiarity with it. I had occasion to examine it and take it apart and clean it during that period.

During my experimentation to produce a flare or torch to be sold in competition with the open wick type of the Toledo Company, I produced a 507 number of different types of devices, wick holders and wick protectors.

Q41. I hand you three wick holders or protectors, and I ask you if you can identify them as structures which you originated, created and tried out with that object in mind? A. This one here was one of them. This was our original burner (indicating), and then I put this cap (indicating) over the flame so as to protect it.

Q42. My question was do you identify all three

508 of those? A. Yes. I identify this one also (indicating).

Mr. Darby: I offer the first one referred to by the witness in evidence.

(The device was received in evidence and marked Plaintiff's Exhibit 37.)

Q43. And you identify this second one? A. Yes.

Mr. Darby: I offer that in evidence.

(The device was received in evidence and marked Plaintiff's Exhibit 38.)

The Witness: Not this one, because this followed in 1930 (indicating).

509 The Court (to the witness): When did you experiment with Plaintiff's Exhibit 37?

The Witness: That was in 1928.

The Court: And when did you experiment with Plaintiff's Exhibit 38?

The Witness: That was in 1929.

Q44. I find that I gave you a wrong one. Do you recognize this (indicating)? A. Yes, I identify this. That was one I experimented with in 1928, also, along with the other one.

Mr. Darby: I offer this third one in evidence.

510 (The device was received in evidence and marked Plaintiff's Exhibit 39.)

Q45. Am I correct in understanding that each of these three exhibits, 37, 38 and 39, were actually structures produced by you as part of this intensive experimentation on your part, in the effort to produce a flare which would withstand wind, rain, weather conditions of a degree of improvement over the open wick type, Plaintiff's Exhibit 11? A. Yes, and I was also striving to get away from that long wick which consumed so much oil.

Q46. And did any of these devices prove to be

successful? A. Yes, with the exception of the protection against rain. 511

Q47. Did any of these devices that I have offered in evidence as Plaintiff's Exhibits 37, 38 and 39, prove successful—so as to cause its adoption by you as your commercial product? A. No, not to that extent.

Plaintiff's Exhibit 37, I believe, is the only one I found to be a successful one. That would operate with a much lower wick and withstand a very high wind.

Exhibit 38 developed in 1929 was not successful. I did not have a large enough combustion chamber 512
in that. It would blow out, and it was not protected from the rain either. Plaintiff's Exhibit 39 was not successful. It would rain out. No protection from the rain. After these experiments, our company came out with a competitive torch, one that was identical with Plaintiff's Exhibit 10. The circular which you show me is the circular of our commercial product.

Mr. Darby: The circular of the first Dietz structure is offered in evidence.

(Marked Plaintiff's Exhibit 40 in evidence.)

The Witness: Our experimentation did not pro- 513
duce a structure which I regarded as better than the open wick type of torch that we ultimately brought out. The wick in our commercial open wick torch had to be carried out about an inch and a half.

In January, 1929, they notified me from the New York office of the Toledo Economy structure.

Q59. Taking you back to the time that you as an inventor were endeavoring to produce a flare in 1928 which would withstand wind and rain, and being at that time and for many years prior to

514 that time, familiar with the burner cap on a gas stove, did that suggest to you any solution to the problem? A. No, it did not; it never occurred to me.

I first heard of the plaintiff's commercial structure, the enclosed flame type, in January, 1929, the company purchased one. They sent one up to me late in February of 1929. We subjected it to tests. Those tests were to determine whether or not it solved the problem that we had been unsuccessful in solving. As a result of our tests I found that it did solve the problem. It became evident immedi-
515 ately that if we desired to remain in the competing field we would have to have something as good. We started out to try to develop something as good during the year 1929. We worked from late February through to November, when we completed our new burner.

Q69. Was that period taken up in trying to devise a structure that copied the Toledo burner, or was it taken up in trying to devise a structure which did not copy it, but which would accomplish the same result? A. No, I made every effort to keep away from their construction. It was marked
516 "Patent applied for." I did not know what their claims were; and so we kept away from it. As a result of that work the structure, Plaintiff's Exhibit 38, was developed. That was one of the experimental burners.

The structure which you have now handed me is the completed burner, the final result of our experimentation, and was placed on the market.

Mr. Darby: I offer that structure in evidence.

(Marked Plaintiff's Exhibit 41 in evidence.)

The Court: How did that work?

The Witness: Perfectly. Some time later we were notified that that structure was an infringement of the Withrow and Close patent here in suit. And as a result, negotiations were entered into between us and the patent owners. Those negotiations resulted in our company acquiring a license under the patent in suit. We are still at the present time a licensee under the patent. Our license agreement provides an obligation on our part to make available to the patent owners any facts which may be of value to them in connection with their patent; that accounts for me being here. 517

518

Cross Examination by Mr. Wisner:

The Witness: I think that some company manufactured an open flame torch prior to 1924 or 1925, but I couldn't tell you who did. There was nothing new about a warning signal of the type of Plaintiff's Exhibit 10 at that time. Our company simply did not make them, we were engaged in the manufacture of red lanterns. In 1928 I started experimenting, trying to improve this open flame torch. The experiments that I made were outdoor tests, both around the factory, and then we have a cottage out about twenty miles, out at a lake, and I 519 was experimenting there every day, principally at night only when I got home. I had the various structures made for me. In connection with those experiments I made an investigation of the art of lanterns. That is, I looked up what patents I could on torches. We have the Official Gazettes that go back for pretty nearly forty years, and I went through those.

The Court: Did you have Rutz and Malcov?

520 The Witness: No—that is, we had their patents in our collection.

The Court: I mean were you familiar with them?

The Witness: Yes, I was familiar with them, yes, sir, but I wasn't familiar with them in 1928; they did not appeal to me at all.

The Court: When did you become familiar with them?

The Witness: I do not think I became familiar with that, or that is, that it appealed to me until perhaps 1930, I would say around
521 that, 1930 or 1931.

The Court: What is the date in your case?

Mr. Darby: 1929, our patent issued in 1929. The filing date was December, 1928.

The Witness: In this search which I made I came across the British patent to Salsbury, we have a record of that patent. I couldn't say how long we have had that, about ten, twelve years, something of that sort. I never made or tested a model using that patent, in accordance with that patent. My first contact with kerosene or hydrocarbon burners was in 1903, that is, a hydrocarbon
522 burner is a lantern burner, and that goes back to 1903. But in the ones without a chimney around them it was in 1928. I started in the field fresh.

XQ94. You characterized your activities as continuous and intensive, as I understand, and you produced three different structures during a period of two years? A. I produced more than that, but these are the only ones that I happened to have handy there.

This one offered in evidence as Plaintiff's Exhibit 37 is the identical structure which I made back in 1928, I had it cleaned up because I did not

want to bring it down here all dirty. The same is 523
true of the other two offered in evidence. Refer-
ring to Plaintiff's Exhibit 38, the structure with an
iron housing, that was made in 1929, after the To-
ledo Economy burner had come out. Plaintiff's
Exhibit 37 burned very nicely in the open air when
I experimented with it. I tried it out in the rain
and it went out. It occurred to me that I might
possibly put a flat shield over the top so the rain
would not get in the center of the wick, that is, that
thought must have been in my mind, but I just
didn't do it.

XQ103. It didn't occur to you that by putting 524
an umbrella over that wick, it would be helpful in
keeping it from being extinguished by the rain? A.
There is no question I knew that, but how to go
about it, I just didn't do it.

XQ104. And yet your efforts were intensive? A.
It was practically daily; we were experimenting
and burning them daily.

I have heard of Argand. That is, as I understand it, Argand was the originator of the tubular lamp.

I dismounted the Rutz structure because the
pilot light would go out, and then it was necessary 525
to take the cap off and use a very fine pin and open
those little ports, I think there are four ports. The
particular structure which I have in my stove was
manufactured by Rutz, that is, it has Rutz' patent
marking on it, I believe. It has a patent number on
it and I think it was back in 1930 or 1931, I can't
remember that, but I wrote to the Thatcher people
asking them who made that burner, and they told
me it was some firm in Milwaukee, some specialty
company. I do not think I wrote to that company.
I think I took that information and started to see

526 what I could find out about it. Then I discovered that we already had their patents in our files. That is, the Rutz patent and a Kahn patent too. At the time that I was making these intensive experiments that I referred to, I did not refer to those patents at all, it never occurred to me. We have hundreds, hundreds of patents in our file, that is, pertaining to lanterns. We index them.

XQ117. Do you mean to tell me you actually went through that file prior to starting your experiments here? A. Yes, I did.

This other little structure, Plaintiff's Exhibit 39,
527 was produced likewise in 1928. That did not function in the wind as good as that cup. The cup was the best in the wind that I ran across. Now, referring to Plaintiff's Exhibit 38 again, this particular structure was put out in the rain and burned. I would say that it was a good heavy rain, and it went out. I ascribe its going out to the openings on the side being too long, and just simply letting too much water in. It did not occur to me at that time that I might narrow that opening and obviate the difficulty.

Upon the top of Plaintiff's Exhibit 41 appears
528 three patent numbers, 1,732,708, 1,089,931 and 1,831,346. Two of those patents are the R. E. Dietz Company patents, and I believe the other one, 1,732,708, is the Toledo patent number. The one patent issued to us there covers that bail locking device that is incorporated into the original burner you have got over there. The other patent covers the burner as an entirety as you have it there, the sliding rain shield on the top, and its combustion chamber and its construction.

XQ131. In any condition except one in which a rather intensive rain is falling the structure oper-

ates, does it not, without this top rain shield over 529
the flame? A. Yes, I guess it does.

XQ132. It operates a little better without rain when this shield is removed, doesn't it? A. I wouldn't say so; it then becomes an open torch, it becomes an open torch burner subject to the varying wind currents.

XQ133. Well, what is the purpose of adding all of these devices so that you can take off the torch top if it doesn't operate better with the top off? A. You see, we are keeping the bail on that to serve as that lock. If you turn it up from the bottom
you will see how it extends into the tube, and 530
then the cam pulls that out.

XQ134. You, however, advertise that under certain circumstances when rain is falling the structure should be in this fashion, and when it is not raining it should be positioned in the other fashion? A. It can be positioned in the other way, yes.

The claim made by the Toledo Company with reference to the operation of its torch similar to Plaintiff's Exhibit 10 was what led us into the business, they claimed that it was going to put the
lantern industry out of business, and we did not 531
believe that it could. They also made some claim about its performance in wind and rain which led us to investigate its performance.

Re-direct Examination by Mr. Darby:

RDQ138. Take your mind back to an answer you gave which was stricken because you volunteered it. Will you state again why didn't the Rutz and Kahn patent for the gas burner art suggest themselves to you when you were seeking for a solution

532 of this problem? A. It would be a very difficult thing to say. It is one of those things which was right under my eyes, so to speak, and yet made no appeal to me. It was nothing new, I have had the same situation arise in lantern improvements.

The Court: What do you mean, right under your eye?

The Witness: Why, your Honor, it is very strange that improvements that we make that have been so obvious to us for a long time, suddenly we become aware of the fact that it can be done.

533 RDQ140. Rutz and Kahn, were they structures having to do with the burning of kerosene fuel:

The Court: They were gas.

The Witness: Gas.

RDQ141. Did you regard structures in the gas-burning art as the same or an analogous art to the kerosene-burning art?

The Court: He can testify to the fact, not as an expert.

A. No, I did not, no.

Our company keeps a current up-to-date file of patents pertaining to the art in which our company

534 is commercially interested. That was the practice in 1928, prior to 1928 and continuously since then. I first informed someone connected with the Toledo Pressed Steel Company, the plaintiff in this action, of the facts that I have testified to here on about February 9th, 1938, when I was down in New York.

JOSEPH E. WITHROW, recalled on behalf of the plaintiff, in rebuttal, testified as follows: 535

Direct Examination by Mr. Owen:

Q198. When you became familiar with the testimony of Professor Croft and the graphs which were produced in connection with that testimony, how did the results to which he testified impress you, as to whether they were proper or improper results? A. They were contrary to my experience. As soon as I got back to Toledo I told Mr. Close about the experiments, so we obtained an Anthes 536 torch and a Toledo torch and we placed them before the wind tunnel to verify or contradict the impression that I got from Mr. Croft's testimony. We placed the two torches in front of our own wind tunnel, to observe the effect of the wind tunnel on the torches. We found that when the torches were placed in the position that Mr. Croft placed them, his observation was correct, but if they were turned at an angle of 45 degrees, the reverse was true. I mean by that that the strip of metal between two of the flame ports was right in a direct line with the air stream. I did not conduct detail tests with 537 them, with that in view. Mr. Close conducted them after that.

Q206. On your testimony in chief, you said that you could blow out a Toledo torch, but you did not explain how. Will you state just how you blow out that torch? A. You place your lips very close to the flame port opening and blow with a sudden burst in a diagonally downward direction, and it will put the torch out. Sometimes it is difficult, but I have never seen one that I could not blow out that way.

Q207. Does that introduce any oxygen? A. Well,

538 you exclude oxygen. You have carbon dioxide coming from your lungs that you blow, and that would help.

I made tests of the Anthes burner with the flange which supports the cap partially cut away. I have here the device that I tested. This is the device, however, the burner was on that other torch body (indicating). But it was on an Anthes torch body. I tested that device before a wind. The results were that at 28.7 miles an hour it would be extinguished almost immediately, and at 26.9 miles an hour it would be extinguished almost immedi-
539 ately, and at 16 miles an hour it remained lighted, but at 16 miles an hour the flame all emerged from the holes that were cut in the flange in the bottom, and none of the flame came out of what we call our flame ports.

Mr. Owen: I offer that Anthes torch with the flange cut away, in evidence as a Plaintiff's exhibit.

(The same was received in evidence and marked Plaintiff's Exhibit 42.)

Mr. Wisner: What they have done, it is rather difficult to see, your Honor, but they
540 have cut away all of these air holes which we have in the bottom of this flange and substituted an almost completely open space. In other words, in the structure as it was intended to operate and which they claim we infringe, we have seven air holes in this bottom flange, that is Plaintiff's Exhibit 26.

The Court: I think having pointed out that, it may be marked in evidence.

Cross Examination by Mr. Wisner: 541

XQ214. To what wind velocity did you subject that device, Plaintiff's Exhibit 42? A. Wind issuing from a wind tunnel, using the restricted plates on the back of the wind tunnel that Mr. Close testified to the other day, and I was testifying to those exhibits as shown under the test that they made at that time, which the wind gauge measured. I did not measure the wind at all. I assumed the same wind they had been measuring in the other trial. At 26.9 and 28.7 miles an hour it blew out, and then we took an observation at 16.3 miles an 542
hour. We did not take any observations below that velocity. We had no control below that. It burned a considerable length of time at 16 miles an hour rate. I did not measure it in minutes. It would go out within a few seconds at the 26 or 28-mile-an-hour rate. We used wick adjustment of three-eighths of an inch. I measured that.

XQ225. When you started the test at the 28-mile-an-hour velocity, had you permitted the flare to burn? A. It was an old wick.

XQ226. Had been used? A. Yes.

XQ227. Will you explain again, because I did not 543
understand it completely, and if necessary, will you point with reference to the flame coming out in the 16-mile-an-hour wind, where they came out? A. In the opening of what formerly was the flange.

That is, they came from underneath. This torch was positioned with reference to the center of the wind stream on the plate as shown in the photograph in evidence here. I think the burner itself was close to the middle of the wind stream. There was no difference in the position of the burner as shown in the photograph put in evidence. No

544 flames came out of the flame ports at all. I would not say that the flame ports were serving as air inlets. I am only testifying to what I observed. As I remember, the flame which came out from below would extend out there probably two inches. I did not make any measurements of oil consumption under those conditions. I did not make any measurements of the height of the fuel in the tank or the container at that time.

The Court: There are four flame ports?

The Witness: Yes.

The Court: Air blowing in from that posi-
545 tion, wouldn't that necessarily force the flame down?

The Witness: Not necessarily; it depends on the velocity, and also upon the position of the device in the wind stream.

The Court: I mean if it were in such a position that it was directed down with sufficient velocity, your flame would go down, wouldn't it?

Mr. Wisner: Oh, sure, your Honor.

The Witness: I understand in the state tests, they revolve the torch.

546 The Court: I suppose they put it all through various tests, in that position.

XQ239. Now, when you have a shield in the center of the wind stream, is that not a more favorable a position than when the wind stream is going directly through an orifice? A. No. I thought so myself until I found that the flame ports of the Anthes torch, parallel with the wind stream, that it gave off the best light, and at a 45 degree angle to the wind stream, then the light became blue and the candle power decreased.

The Court: Is it your testimony these holes

in the bottom do not make it as efficient as your light? Is that what you are saying? 547

The Witness: No. I was only testifying to these experiments that I made for the purposes, as I understand it—

The Court: You are just stating the fact?

The Witness: Just stating the fact.

My observation of illumination was by my eye only. I used no instrument to measure it. When the Toledo structure was placed with the air port parallel to the wind stream, it was quite blue. When the flame ports are placed parallel with the wind stream, the Anthes produces a very luminous 548
light, and the Toledo produces a blue flame. When they are turned at a 45 degree angle, the Anthes flame turns blue and the Toledo becames more lunimescent.

XQ244. The performance was different? A. Quite the opposite.

With the 16-mile-an-hour wind, with the Anthes torch, the flame coming from the bottom orifices or slots which I had drilled in the structure was visible. The flame was a little yellow.

Lyman W. Close, recalled on behalf of the plain- 549
tiff, in rebuttal, testified as follows:

Direct Examination by Mr. Owen:

The Witness: I have manufactured torches and flares continuously since 1925. I have manufactured close to a million. My duties have brought me in very intimate contact with the conditions of use of these devices in the field. I am familiar with all of the conditions of use. The testimony of Mr. Croft and the results shown on his graphs did

550 not coincide with my own experience. They were in opposition, they did not follow our own experience in that they seemed to give results which were entirely opposite from those we had obtained in our own tests and our own experience. I understood that their tests were conducted all with the air draft passing through from one flame opening and out of the other.

The wind tunnel tests that were previously mentioned in my earlier testimony were made to check the results shown by the Croft tests. And in subjecting these two torches to different conditions
551 we discovered that there was considerable difference in the amount of light offered by the Anthes torch in a 45-degree position as compared with a 90-degree position. And we checked our own torch, and we found there was also a difference in those positions with our own torch, but strangely to say, they were in the opposite direction from those of Anthes. In other words, the better flame was produced with the Anthes torch in the 90-degree position, or with the holes coincident with the direction of the air stream, and a poorer flame was produced when the torch was rotated so that those
552 holes were at 45 degrees; whereas, in our own torch, the better flame was produced in the 45-degree position as compared with that produced with the torch in the 90-degree position. I took readings of those tests with a Weston foot candle meter supplied by the Toledo Edison Company, Illuminating Engineering Department. I can give the results of the tests that I made. I have them both in detailed form and I have a summary. The detailed report reads as follows:

"LIGHT INTENSITY TEST 553

"*Object*:

"The purpose of this test was to determine relative intensity of light issued by Anthes and Toledo Economy Burners at various wind velocities and different positions of burner hoods, with respect to direction of wind stream.

"*Apparatus*:

"Experimental wind tunnel constructed by The Toledo Pressed Steel Company after design suggested by The DeVilbiss Co. (Illustrated by Plaintiff's Exhibit 31.) In place of using a variable speed motor, a series of cardboard reduction plates 554
were used to secure variations in wind velocity. These were applied to the intake end of the tunnel as shown in illustrations herewith.

"One regular Anthes truck flare, purchased from Montgomery Ward & Co. at Lima, Ohio.

"One regular No. 770 Toledo Truck Flare.

"A Model No. 614 Weston foot-candle meter borrowed from a Toledo Edison Co. illumination engineer. This instrument was part of his everyday working apparatus and was vouched for by him as being accurate and in good condition. The instrument was secured by Mr. Close in whose possession 555
it remained until it was returned.

"*Procedure*:

"The Anthes and Toledo Torches were both given a wick extension of 1/8" and were lit and allowed to burn until operating in usual manner. The tunnel was then put in operation at full intake capacity. Each torch was then placed successively on the shelf at a distance of one foot from the discharge end of the tunnel. The torch was placed so that the flame ports of the burner were at right angles to the direction of the wind stream. The

556 readings for light intensity were taken at a distance of six inches from the flame and are represented in the tabulation as an average value of the vibrating range of the needle when the meter was switched to its lowest recording position. This figure represents the average foot candles of light which were impinged upon the vertical surface of the photo electric cell element of this device.

"After observing the results in this position, the torch was rotated until the flame ports were all at 45 degrees angle to the direction of the wind stream. The readings were also taken in this
557 position.

"When readings in both positions had been made for the Anthes torch, the same procedure was followed with the Toledo Torch.

"After conducting the experiment at full intake capacity, successive experiments were made using reduction plates providing substantially 25%, 50% and 75% reduction in area of intake, and the results noted in each case. Then the entire experiment was repeated using a ⅜" wick extension.

"Through the use of a Taylor Vane Type Anemometer, supplied by the DeVilbiss Co. and oper-
558 ated by Mr. Dukes of the DeVilbiss Co., the velocity of the air at the various stages of reduction was measured and these average velocities were established as 16.3 m.p.h., 25.1 m.p.h., 26.9 m.p.h., and 28.7 m.p.h. from the greatest reduction to the open full capacity, respectively.

"This experiment was conducted in the space below the stairway in the hallway compressor room in the factory of The Toledo Pressed Steel Company and the light is supplied by a single window; illumination entering the room from this window 20 feet above the stairway above the experiment was

not enough to register on the meter at the point of the experiment so that it is not considered that this source of light had any influence on the results. 559

"The room temperature was between 65° and 70° Fah.

"Fuel used was kerosene. Sp. gr. 7995. Flash pt. 135°.

"The experiment was conducted on Jan. 28th, 1938, beginning at 2:30 P.M. and was conducted entirely by Mr. Close who both read the meter and recorded results.

"*Results*: 560

Wind Velocity m.p.h	Torch	Position of Flame Port with Respect to Direction of Wind Stream	Foot Candles at 1/8" Wick Extension	Foot Candles at 3/8" Wick Extension	
28.7	Anthes	right angles	5	7	
	"	45°	2½	3	
	Toledo	right angles	2	2½	
	"	45°	2½	5	
26.9	Anthes	right angles	7	6	
	"	45°	2½	3	
	Toledo	right angles	3	3	
	"	45°	4	5	561
25.1	Anthes	right angles	10	9	
	"	45°	3½	4	
	Toledo	right angles	2½	5	
	"	45°	5	9	
16.3	Anthes	right angles	18	12	
	"	45°	7	5	
	Toledo	right angles	7	5	
	"	45°	21	13	

"*Conclusion*:

"The results in this test show that there is a

562 difference in the brightness of the flame issuing from these torches, depending upon whether the flame ports are coincident with the air stream or at greatest possible deviation from coincidence. This experiment further demonstrates that whereas the brightness variation is opposite in these two torches, the averages, which represent more nearly the practical conditions of use, are practically coincident so that it can be considered that no substantial difference exists in the brightness of these torches at the same or comparable wind velocities in actual usage."

563

"SUMMARY"

"Total foot candles at four wind velocities (16.3, 25.1, 26.9 and 28.7 m.p.h.) with flame openings at right angles to direction of wind stream—

	1/8" wick extension	3/8" wick extension
Anthes	40	34
Toledo	14½	15½

"Same with flame openings at 45° to wind stream—

Anthes	15½	15
564 Toledo	47	47½

"Total foot candles at four wind velocities (16.3, 25.1, 26.9 and 28.7 m.p.h.) with flame openings at right angles and 45° to wind stream—

	1/8" wick extension	3/8" wick extension
Anthes	55½	49
Toledo	61½	63

TOTALS

Anthes	104½
Toledo	124½/"

The Court: Upon this summary where you say 40—

The Witness: 40 foot candles right on the 565
instrument.

The Witness: I have witnessed thousands of open air tests and operations of torches and flares both of the open and closed flame type.

Q154. Which would you say would be the fairer test of the efficiency of a flare, to place the flame opening always in one position with reference to the air stream, or to rotate the flare so that it would be in different positions with reference to the direction of the air stream? A. Well, obviously the rotation of the torch would subject it to different
conditions, that is, you mean to place it— 566

Q155. I mean which would more closely approximate outdoor conditions where the devices are intended to be used? A. That is what I understood. Yes, rotating it would more closely approximate the outdoor conditions, because then you would get the wind currents directed, it would be equivalent to wind currents directed to the flame from different directions, which you would experience in outdoor conditions.

I heard Dr. Luckiesh testify that the average wind velocity throughout the United States at a
point six inches from the ground is about one mile 567
an hour. That does not coincide with my experience. I know of no average such as that. I would say that the occasions arise so often in the operation of a torch when the velocity at the ground is so enormously greater than one mile an hour that I would have to question an average of any such small proportion as that.

I stated that I have witnessed thousands of operations of these devices in the open air. You can tell from watching them in operation, whether there is any air stirring—you can always see the

568 flame moving. I have never seen any conditions
when the flame was not moving, when the torch was
placed outdoors.

I would consider the proper way to test two devices for fuel consumption, if they were intended to be used in the open air for periods up to 12 hours or more, without the attention of an attendant to be to simply fill the torches and adjust them as they were supposed to be used, and recommended by the manufacturer, and light them and go away and leave them for the required length of
time. I do not know of any fairer way to make
569 such a test. The differences in the size of the fuel
tank should not have any material effect on the reliability of such a test.

With reference to the capillary lift there is in our torches and flares, we know they burn dry, and therefore the oil will lift the full height of the torch. I have never known one of them to fail from lack of fuel supply at the exposed end of the wick when there was fuel left in the tank and the wick was long enough to reach the fuel. After eight hours burning, the depths of fuel ordinarily left in
our torch or flare would be from one-third to one-
570 half, it depends upon whether you are speaking of
the flare or the torch.

Cross Examination by Mr. Wisner:

The Witness: This photograph, Exhibit 31, which has already been offered by the plaintiff, is a photograph of the wind tunnel apparatus which was used in these tests which were last introduced in evidence, about which I testified on this direct examination. In these tests for illumination, the torch which was being tested was in the position as

shown in the photograph, slightly below the center of the wind tunnel, below the horizontal center. It was approximately one foot away from the end of the tunnel. If I recall correctly, the torch in the tests taken by Professor Croft was placed considerably further away from the end of the tunnel than that. The illumination readings for arriving at foot candles produced by torches in the tests that we ran were taken at different positions, at a 6-inch radius around the light. I think we averaged between five and eight readings on each position during a period of time just long enough to take the reading. You could run that whole test there in less than an hour. That is, all the data which appears here was secured in less than one hour. I made no observations of fuel consumption during this time. The performance results which I obtained between the Anthes and the Toledo were opposite to each other, but of similar quality, in the opposite direction. 571 572

XQ178. Now in the rotation of this torch on a table before a wind tunnel, have you ever observed in actual practice, wind swinging through an arc of 360 degrees within a minute, or four times a minute? A. A good many times, yes. 573

When I testified with reference to the velocities of wind which I have observed within a foot of the ground, that is without any basis of measurement except the fact that I saw objects which would obviously require considerable wind pressure to move them, being lifted completely off the ground. Not necessarily in a hurricane but we certainly have gale velocities in ordinary weather. I have seen pieces of paper and dirt occasionally lifted up from the ground.

XQ182. When a substance is lifted from the

574 ground, ordinarily it has a large surface area? A. I was just mentioning dirt and gravel and small particles.

I am not familiar with the results obtained by the United States Department of Agriculture at their evaporation stations.

In the foot candle meter readings which were taken at various positions around the circumference of the circle an attempt was made to get as wide a variation as possible. Some readings were taken at one point of the arc of the circle and some at another, but no definite space between except we
575 duplicated them in the two torches. Whatever we did for one torch we did for the other. And we took these candle readings at 6 inches and the meter readings in foot candles. There are three scales on that meter. That is No. 604, I believe. I made no adjustment for the 6-inch. I took readings given by the low scale at 6 inches, and those readings represent that. I do not know that the instrument we used was such that we could set it at 6 inches and obtain foot candle readings, but I know the figures represent the foot candle readings on both of them.

576

John C. Olsen, called as a witness in rebuttal, in behalf of plaintiff, being first duly sworn, testified as follows:

Direct Examination by Mr. Darby:

Q1. Will you please state your age, residence and occupation? A. I am 68 years old. I reside at 3116 Argyle Road, Brooklyn, New York.

Q2. With whom are you associated? A. I am a professor of chemical engineering at Polytechnic

Institute, Brooklyn, and a consulting chemical en- 577
gineer.

Q3. Will you state very briefly your education, training and experience, which would qualify you to testify as an expert in a case involving the combustion of fuels for the purposes of lighting? A. I received my education at Knox College, and my university training at Chicago University and Johns Hopkins University, receiving the degree of Ph.D. or Doctor of Philosophy at Johns Hopkins University. I have been employed at Polytechnic Institute, since 1900, with a short period of four
years at Cooper Union, head of the department 578
and professor of chemistry.

I have been a consulting chemical engineer and have studied and testified in a good many cases on combustion and explosion of various fuels, such as gasoline and other combustible liquids.

In connection with my work it has been necessary to make a study of various fuels and their combustions, and burners or other methods of burning the fuels, the air supply, the amount of fuel and the amount of air necessary for combustion, and the nature and character of the fuels,
their manufacture and their use. 579

Q4. And in preparation for your testimony in this case, were you handed a flare or a torch of the plaintiff's Economy burner, and the Anthes structure, here charged to be an infringement? A. Why, I purchased the flares that I used, getting three of the Anthes flares and three of the Toledo flares from the companies that sell these, namely, Montgomery Ward and Sears Roebuck Company, who have stores in this area, and I used these which I purchased for the tests that I carried out.

Q5. And were you informed these flares would

580 withstand weather conditions, including wind and gale velocities, without being blown out or rained out? A. Yes, when Mr. Withrow told me about this case, he said they had a flare and there was also a competing flare which he said would not blow out at 40 miles an hour or higher.

Q6. And how did that check with your knowledge and experience, based on your experience with the use of fuels for light purposes? A. All ordinary lamps and flames that I have been familiar with could be easily blown out, except possibly lanterns which were especially designed for that pur-
581 pose, and I was very much surprised when he told me that he had a open flare, in other words, an open flame that would keep burning at a 40 mile an hour wind, and I was very much interested to know what this device was and how it was constructed and operated, so that it would not be blown out at that wind velocity.

Q7. And what do you understand to be gale velocity as defined in Webster's dictionary? A. It may run up to 65 miles an hour or possibly more, and they call it a gale when it is considerably less than 40 miles an hour. It is a very strong wind, and
582 exerts a great deal of pressure, and, of course, 40 miles an hour is a very high velocity, and flames, of course, are gases, that is combustible gases mixed with air, and, naturally, with such a high wind velocity, you would imagine that it would carry the whole business away.

Q8. Now, do you accept Webster's dictionary's definition as a gale being between 25 and 75 miles an hour? A. Yes.

Q9. And did you make a scientific study of these burners to determine what enabled them to withstand gale velocity without being blown out? A.

Yes. That is the first thing I started out with. I 583
said to myself, the only way I can understand this situation is to try and find out what it is in this structure that enables it to withstand that wind velocity when ordinary flames go out so easily. I had to take into consideration in that respect the nature of the fuel, because I realized that it would make a difference as to what fuel you were using, and we have three common fuels used in flames, they were manufactured or natural gas, which is already in the gaseous form, and gasoline, which is used in internal combustion engines, and we have kerosene.

Now, these three fuels are very, very different 584
from the standpoint of the burner, either for light or heat. The gas is already in the gaseous form, and therefore nothing is required to convert it into the form in which it should burn; and all flames are produced by the combustion of a gas. So that if you are going to burn kerosene or burn gasoline you have to convert it to vapor form, otherwise you cannot get a flame.

Now, gasoline very readily volatilizes, in fact, it will cause such combustible vapors 'way down to zero Fahrenheit, so that you can use it in internal combustion engines and start your engine in cold 585
weather.

Kerosene, on the other hand, gives off no combustible vapors at ordinary temperatures; in fact, you have to heat it quite a lot before you can get sufficient vapor to give what we call a flash. You can throw a match in liquid kerosene, and nothing will happen, it won't burn, it cannot burn as a liquid. And you cannot burn it on a cold metal surface or anything outside where there is no heat. It simply cannot be done. The only way you can

586 burn kerosene, therefore, is to have some device by which it is vaporized.

Now, the form which has been used for centuries, or the method which has been used for centuries, is the use of a wick, and by using a wick you have a small amount of fuel which can be heated with a match or other source of ignition, and you get a very small amount converted to vapor. This produces a flame, and the heat produced by that flame will then heat the rest of the wick with the kerosene on it and convert that into vapor, and then you have the flame going all the
587 way around arising from the vapor. If you in any way prevent this process of vaporization of the fuel your flame will go out, because you haven't got the necessary vapor to feed the flame.

Now, in studying this device, I considered the fact that even in a high wind, that the kerosene must be heated up to the flash point, as we call it, which is as low as 135° Fahrenheit, and it varies somewhat with commercial kerosenes, but it will run up to 150 or 160 degrees Fahrenheit, which is a relatively high temperature. In other words, you have got to heat the fuel to that temperature, and
588 maintain it there in order to have it burn.

Now, I found that this device had a little chamber, I call it a combustion chamber, in the bottom of the cap, and that this is protected, and there are some air holes which are restricted, not too big, so that when you once light it you have a little chamber where a little air is admitted, and which maintains the temperature of the wick to the point where it will give off vapor.

I tested that apparatus by burning it for five or ten minutes, and then I used a thermometer to test the temperature of the kerosene, which is fed up

through the wick, and I found that that tempera- 589
ture was well above the flash point, it ran up in
some tests as high as 210 degrees Fahrenheit,
which is way above the proper temperature, and I
think the lowest point I got was something like
153 degrees. And this temperature was reached
even in a 40-mile wind. In other words, high wind
velocity did not seem to succeed in eliminating this
little flame, or cooling the kerosene, whether it be
the Anthes or the Toledo; they both acted alike in
that respect, they both gave us this high tempera-
ture of feed.

Now, above this little combustion zone is an im- 590
perforate cap which, of course, would serve to keep
water off the wick. If water soaks the wick,
naturally it would vaporize and cool the wick down
below the temperature at which the oil would
burn, and the flame would go out. So that covered
the matter of water, and this wick also got hot—

Q10. The wick? A. The cap also was heated, yes,
the cap. I determined the temperature of the cap,
and I found the temperature of the cap would run
up over 200 degrees Fahrenheit, and even a little
higher. I think I got figures as high as two or
three hundred degrees. 591

Now, this cap being of metal, and being maintained at these temperatures by the flame, would conduct the heat into the flange and into the tube surrounding the wick, and this heat would supplement the heat from the small flame in the combustion zone, and would succeed in maintaining the temperature of the wick and the wick tube and the kerosene, so that you had a constant feed of kerosene which would be vaporized and keep that flame going.

And when I reached that conclusion after these

592 experiments, I thought I understood how this device operated.

Q11. Did you determine whether or not there was any difference in operation, or reason for difference in operation between the plaintiff's structure and the defendant's structure? A. I examined these two structures, and I found that they each had the same essential parts, they each had a cap with a flame opening, and this cap was connected with the flange which was connected with the wick tube, so that I could see in each case the heat would be transmitted into the wick tube.

593 Each of these two instruments also had restricted air openings into this combustion zone which I have designated, and therefore it would keep this little flame operating.

When I tried these two flares out, I found that they operated under ordinary conditions, that is, without much wind velocity, similarly. And I subjected the two of them to varying wind velocities, and I determined the fuel consumption, I determined the temperature of the kerosene in the wick, and I determined the luminosity of each of these flames. And I used three of each so as to

594 overcome any individual differences. And when I got through and averaged up, they were just about as alike as two twins, or two peas in a pod. There were little differences, but I thought they were insignificant.

My conclusion was after these tests that they acted identically so far as reasonable allowances for slight variations would hold. I could get just as big a variation between three different samples of the Anthes flare and from three different samples of the Toledo flare as I could between any two of them. The variations were well within the

limits of manufacture and use of these devices. 595

Q12. To be a little bit more specific, did you find any difference in principle of operation between the Anthes flare and the Toledo flare, difference in principle of operation. A. No, they both had all the essential parts; neither of them was missing in any essential feature. Whatever differences there were in construction, such as the air openings at the side and at the bottom, didn't seem to make any difference in the operation of these. In each case there was enough air admitted to maintain this flame in the combustion zone which, to my way of thinking, is the actual, the essential 596 part of this device, or at least a very essential part, that they do maintain that flame and under high wind conditions, so I couldn't see any essential difference between them.

Q13. Did you find it made any difference whether the air was admitted from the side of the cap or from the bottom of the cap in maintaining that air in the combustion zone? A. It was maintained equally well in each place, and it heated the kerosene equally. I think I got a little higher temperature of kerosene with the Anthes, I think I got a temperature of 210 with the Anthes and with the 597 Toledo I got 201. But I did not consider that difference of 9 degrees anything essential, because they were both so far above the flash point that for practical purposes it was the same thing.

Q14. Did you hear the testimony of Dr. Luckiesh? A. I did.

Q15. To the effect that by putting the air intake holes in Anthes at the bottom of the metal cap, as distinguished from at the side of the metal cap, that an entirely different principle of operation was involved? A. Not that I could see; I couldn't—

598 Q16. My first question is, did you hear Dr. Luckiesh's testimony? A. Yes, I did.

Q17. Do you agree with that? A. I do not agree there is a difference in principle or difference in operation, no.

Q18. Have you made yourself familiar with the instances of the prior published art which have been cited in this case? A. I have.

The Court: I think we can confine ourselves, so far as the patents are concerned, to three patents.

Mr. Darby: I am going to, your Honor.

599 The Court: You agree to that, do you not?

Mr. Wisner: As anticipations, you mean?

The Witness: Anticipations.

The Court: Will you name them?

Mr. Wisner: Rutz, Malcov, Argand and Salsbury.

Mr. Darby: Then there are four of them.

The Witness: You have got Rutz here.

Mr. Darby: Rutz, Malcov, Argand and Salsbury. I do not find Argand—

Mr. Wisner: Argand is a description.

Mr. Darby: I can ignore Argand then?

600 Mr. Wisner: No, no.

Mr. Darby: Argand and Salsbury; there are four. If your Honor will permit, I will ask one blanket question that will take care of the remainder as well as those four.

The Court: All right.

Q19. Will any structure of the prior art as established by the patents and publications, all of the patents and publications set up, accomplish the same result, in your opinion, as is accomplished by the Anthes and Withrow flares? A. No, I do not

think there is any device of the prior art that 601
accomplishes what these two do.

Q20. In the first place, let me ask you this, Doctor: Do you consider a gas burner, gas stove burner of Rutz, to be an art analogous to a kerosene wick burner? A. Why, no, because in using gas you already have it in the vapor state, and you also have it under pressure. You need have no worry in that case that your fuel supply is gone. There is no provision therefore—you need to have no wick, you need to have no heating of your kerosene, and you need to have no provisions of that
sort. In the gas burner you already have your 602
fuel coming in the vapor state through the pipe and out of your little jet here, and unless the wind blows it out, why, that jet will keep burning.

Q21. Let me ask you this, Doctor, is the gas burner type of Rutz deliberately designed so as to avoid heating the cap or any part of it. A. Yes, that is what Rutz says, that he did not wish the cap to be heated. He did not desire the cap to be heated, and he took every means to prevent it from being heated. In his case it was undesirable. In the case of these other burners it is quite helpful,
to say the least, if the cap keeps hot, because it 603
does help to heat the fuel and keep the flame going.

The Court: What prevents it in Rutz?

The Witness: He placed it centrally so that it would not heat the sides, or he did not want it to heat the sides, which it might do if it was placed over on one side. Then his pilot-light is very small, in the first place, and when his fuel actually does burn the pressure of the gas will thrown the flame out of this opening, that is what throws the flame out—

604 The Court: What is the number there?

The Witness: Out of the opening 12. This is the opening through which the gas jet is to go. And he has sufficient pressure in his gas to eject the gas in a stream out of that opening, and then it burns outside of the opening and is subjected, of course, to any air currents which you may have. We have no such pressure up here at all; any pressure we have here comes merely—

Q22. Referring here to Fig. 1 of Exhibit B? A. In this Exhibit B we have no pressure at all, and
605 this flame gets out of here either by wind currents or by the evolution of gas down here, or the draft of air which comes here and carries it out. It is a different construction, and operating with a different fuel and different conditions, therefore it must be designed differently. You must design your burner for your fuel. They must go together, and the man designing a burner for gas has a very different condition from designing a burner for a liquid fuel like kerosene, whether it is to be a lamp or a burner to produce steam and heat the house.

The Court: If you put a kerosene oil burner

The Witness: If you put a kerosene burner in here there is no assurance that you will have
606 in there, would it be efficient?
here, that you have the proper openings for your flame to go out, or whether your air supply down here is proper and right. This air supply here must be just such as to keep this burning here. Here there is no such necessity. These openings may be too litle or they may be too big. The size of this may not be just right; this cap may be out of line with it, and therefore you might just as well start afresh

in designing this thing; you would probably 607
do better if you did and forgot that thing.

Q23. I would like to get it clearly on the record just what the Rutz patent teaches as to its operation. If I correctly understand it, gas under pressure, illuminating gas under pressure, is fed through the pipe line numbered 4, is that correct? A. Yes.

Q24. And that gas burns in the form of a very small, little blue flame at the tip of that tube, is that right, the tip 9? A. They usually have a little separate line—

Q25. I mean as shown in the patent. A. As 608
shown in the patent, yes.

Q26. As shown in the patent there is a small flame there? A. There is a little opening there for it, in fact.

Q27. That flame does not impinge thus far against any part of the structure, does it? A. No, sir.

Q28. At the very tip 9 there are what appear to be outlet ports; you understand there are four of those altogether? A. Yes.

Q29. And directly in line with each of those
four outlet ports is a larger outlet port numbered 609
8′, and there are four of those, is that right? A. Yes, sir.

Q30. And when you operate this device you press a button or something of the sort on the stove which increases the gas pressure, and four jets of flame extend from the tip 9, is that right? A. That is right.

Q31. And still those jets do not contact with the— A. No, sir.

Q31. (continuing)—with the cap, is that right? A. That is right.

610 Q32. And the tip 9 is closed at the top, so that there is no flame directed upwardly, is that right? A. No, sir; there shouldn't be any flame directed upwardly.

Q33. With that understanding of the operation of this device, I direct your attention to the language of the Rutz patent, which Dr. Luckiesh had a little difficulty in understanding; namely, "It is also essential to perfect combustion that this torch head tip, 9′, which burns a constant pilot flame, should be spaced at a distance equal in all directions from the walls and dome of the hood to pre-
611 vent generation of foul gases through the heating of said hood."

Will you state whether or not that teaches you to heat the hood for a useful purpose? It does or does not teach you to heat the hood? A. No, he is looking out for foul gases, and if his flame comes in contact with this hood it would heat the hood and cool the gas, and there would be partial combustion or incomplete combustion, and you would get certain foul gases.

Q34. Is he teaching you not to heat the hood so as to avoid the foul gases? A. Yes, and still fur-
612 ther, his problem is so totally different from this problem it would not teach you anything about it, because up here you aren't worrying about foul gases because this is an outdoor affair, and you do not care whether there are foul gases or not.

Q35. Will you please give us your opinion as to whether or not with full knowledge of the Rutz patent and its disclosure, would it give any helpful information to one seeking to produce an open air enclosed flame torch that would withstand wind velocities of gale proportions? A. No, I can't see that it would.

Q36. There is another phase of this Rutz patent. 613
First let me ask you this, does the patent point out the purpose of the bottom holes 6 and 7 in the Rutz patent? A. I think he says he gets a column of air going up each side, as I remember it.

Q37. He gets a column of air going up for what purpose? A. I believe he thinks that helps to protect his flame from being blown out.

Q38. In other words, he would put a complete cylinder of air around his flame? A. Yes.

Q39. Which is a small pilot? A. Yes.

Q40. And what velocity of wind, in your opinion, would be protected sufficiently by a column of air 614
of that kind? A. That depends on the velocity of that air current going up, which naturally wouldn't be very high, and naturally would not protect a flame agains any high wind velocity outside. He is protecting his flame against modest gusts of wind that might occur in a kitchen either by movement of articles or the opening of a door, such as you would call a draft of air. For that purpose his column of air probably is of some value. But if you took that out in a high wind I don't think it would amount to anything, it seems to me.

Q41. All right, let us take up this Russian 615
patent, Fig. 4 of Defendant's Exhibit B. Do you agree with Dr. Luckiesh—

The Court: That is the Malcov patent?

Mr. Darby: Yes, the Malcov patent, Fig. 4, Exhibit B.

Q41. (continuing)—Do you agree with Dr. Luckiesh that the disclosure of this patent is ambiguous and vague? A. Oh, yes, I spent a lot of time on that trying to figure it out.

Q42. Have you yet figured out what the structure was? A. I am not certain we have got it

616 figured out, but I think this is probably a close approximation to it. Whether it is right or not, whether there are four members supporting this or two, is a question. It seems to me there are only two, and I think in the model he has got four. I think his description indicates only two. Other than that he did have a perforated top and a couple of wings, shown here. (Indicating.)

Q43. And when you refer to the model, you mean Defendant's Exhibit I? A. Yes.

Q44. Now, will you state specifically with reference to the Malcov structure whether or not in your
617 opinion it could accomplish the results of either the plaintiff's or the defendant's flare structure, and state your reasons. A. The great weakness of this design, if you are going to take it out in the wind, is it is entirely open. In other words, his flame is entirely unprotected, there is no protecting cylinder, as there is here in the Anthes flare or as shown in the Withrow patent. In other words, your wind would sweep right through, with no protection and probably a very low wind velocity would blow that out.

He, of course, has a top to it through which, ac-
618 cording to the illustration of the patent, the flame comes. And if the flames come through these openings, they will have to be much larger openings than what we call pinholes, because a flame will not go through a small opening.

Q45. Now, if these openings at the top would be large enough to allow the flames through, would they allow rains through? A. Yes, I think that in rain it would get soaked nicely. It would blow in at the sides. The sides are entirely open to any gusts of wind containing drops of water. I don't

think it would be of any use at all as an open out 619
door torch.

Q46. Well, do you agree or disagree with the
testimony of defendant's expert that there is not
any novelty in principle or operation of the flare
of the Withrow structure over these prior art
structures? A. No, I do not agree at all with him
there. I think it is a totally new idea that has
never been utilized. I do not know of any prior art
burner that has been constructed on the prin-
ciples of these two torches, and I don't know of
any other prior torch or burner that has ever been
devised that would resist the wind velocity that 620
these two will resist.

Q47. Now, will you please tell us about this
Argand patent? A. The Argand patent merely
discloses or describes what we call primary air and
secondary air. In other words, he quite correctly
says if you have trouble with the flame smoking
you have not enough air and if you introduce a
little more air, you will give a more complete com-
bustion and then he has air around his flame
Then he speaks of the chimney or pipe which, of
course, helps to hold in the heat and prevents mild
air currents from interfering with it, so his prin- 621
ciple I will agree with, but there is no structure
described, and it is well known in the art that you
can produce even a colorless flame, if you produce
enough primary air, and if you want the flame for
light, which does not smoke, you introduce it in
small amounts. You may not introduce too much
with your flame. In fact, we could take the Argand
principle and make a heating flame out of it quite
readily by the amount of air we introduce as pri-
mary air.

Q48. Now, referring to the Salsbury patent of

622 1895, No. 16,524, would that structure perform the
function and serve the purpose of either the plain-
tiff's or the defendant's flare? A. This structure,
which is commonly placed over flames used for
light which assists in carrying out, I might say,
the principle of Argand so as to get a little more
complete combustion and a little better flame. He
has some air openings for his primary air, but his
flame is not protected against wind or rain so that
I would not consider that that would be helpful.

Q49. Will you compare the disclosure of the
Salsbury patent with Plaintiff's Exhibit 39 and
623 Exhibit 37, which were evolved by Mr. Currie in his
unsuccessful efforts to solve this problem? State
how in principle of operation the Salsbury patent
differs from those structures, if at all. A. Well,
in the Salsbury patent he introduces air through
two devices, that is his Ring B and then in his little
hood he has openings all around. In this device he
is limited very much to just a few openings here
around the flame (indicating), and has this cup for
the flame to burn in. But this is altogether too
exposed to stand high wind velocities. In this
device he has changed the shape of the lamp, mak-
624 ing a difference, it probably would. Now, in the
Salsbury device he is producing a flame for illumi-
nation probably which would be of a different form
from this (indicating). He has departed quite a
good deal in this device here from what he has in
there (indicating).

Mr. Wisner: By "this device," you are referring to what exhibit?

Mr. Darby: Exhibit 37.

Q50. Did you participate in the tests that Mr. Close last testified concerning, on the stand? A. Yes. He was at the Polytechnic Institute when we

made some tests in the wind tunnel at velocities 625
from 20 to 30 miles an hour on the Anthes and
Toledo torch. We turned the burners in the 90-
degree position that has been described, and the
45-degree position, and we took the luminosity at
6 inches away from the flame and I averaged up
all these results. In other words, for a given flare
I would take the mean or the average of the
figures at 90 and 45 degrees, and then I would just
take the average of the luminosity at the three
wind velocities. I did the same thing with the
other flare, and when I came to my final total
average, they were practically identical. They 626
were so close together that you would not know
which was which. In other words, between 20 and
30 miles an hour, and measuring light at 90 degrees
and 45 degrees on the two flares, their luminosity
was identical.

Q51. Dr. Olsen, in comparing the fuel consumption of two open wick burners of any type, and regardless of the purpose for which it is used, does it make any difference what the size or shape of the container for the fuel may be? A. Not for
making a test, but the container must have enough
fuel to burn for overnight, in other words, 12 or 14 627
or 16 hours. If you burn a whole lot of fuel you must have a big receptacle. Outside of that you can test them for comparative purposes by putting them under identical conditions and weighing before and after.

Q52. In determining the relative efficiency of an enclosed flame and an unenclosed flame burner, first, in your opinion, tell us is it a fair test to take a burner designed for a closed flame operation and merely remove its cap and compare its efficiency in the two conditions without change. A. I would

628 have to find out that each functions properly under the conditions to be tested. In other words, I would have to first find out whether the open flame will keep burning, and if it does not, then it is not worth anything in my opinion.

Q53. My question is directed to this: Is there a difference in structure in a device which is designed for open flame work? A. Absolutely.

Q54. As compared to a device that is designed for enclosed flame work? A. Of course. You can use a much smaller flame in a closed structure. If it is going to be an open flame, you may have to
629 make many modifications and changes in order to have it operate properly.

Q55. Did you hear the testimony of Dr. Luckiesh that the average wind velocity of the United States at one foot from the ground is 2 miles an hour and 6 inches from the ground is 1 mile an hour? A. I heard that.

Q56. Do you agree with that? A. I have no means of disagreeing. Maybe he is right. But what of it? I have never tested the average wind velocity. I don't think I have any interest in knowing it.

630 Q57. Let us confine ourselves to locality in this vicinity with which you are familiar. Would you say that statement would be correctly applied to parts of New York? A. Once more, I don't know whether it is or not. I know that we have high wind velocities and low wind velocities. Sometimes it almost takes you off your feet and raises dust and dirt, and clearly we must have very high wind velocities at the surface. What the average is I am in total and complete ignorance. I am not competent to testify on that point.

Mr. Darby: You may inquire.

The Court (to the witness): Have you had 631
an opportunity to examine Defendant's Exhibit L?

The Witness: Yes. I did look at that. Well, I cannot tell, but I assume that there are openings underneath. That I don't know.

The Court: Now does it or does it not follow the teachings of Rutz?

The Witness: No. I don't think so, Your Honor, because you see he has taken the cap off Rutz and put it on the bottom of another device which was designed to burn kerosene. He has taken part of Rutz and part of some- 632
body else and stuck them together.

The Court: In what respect doesn't it follow Rutz?

The Witness: The cap, I suppose, may have been constructed according to Rutz. So far as this goes, when he puts this on (indicating) he had these openings and this here (indicating). In other words, his intake is there (indicating), and he has little openings here which will carry the air in (indicating). I don't know whether flame would come out. I
doubt that it is big enough. 633

Mr. Wisner: The cap is removable, Your Honor.

The Witness: Yes. Now, whether that has got enough air, that is another question. Whether those air inlets are what they should be, that is another question. If he merely copied Rutz, the chances are it would not be right. He would still have to modify this thing. The openings here (indicating) and here (indicating) would be more than he ought to have, and as to whether this is big enough or large enough, that is another question.

634 You still would have to take that thing and proceed to experiment with it to find out whether he had a satisfactory flame, and I should judge from looking at it that it would not have a satisfactory flame, to any commercial device. You can't take a commercial device and take one little thing and have it o. k. You must have it all o. k. It must be carefully designed and made just so.

The Court: What I am trying to get at is if you put kerosene light in Rutz, will it work as a torch?

The Witness: In so far as he has done that,
635 it would. What he has done here is take part
of the structure and put the two together, he
may have done so. If you give me $10 and I
get $10 from him, that is $20.

Mr. Darby: I will try to clear it up by some specific questions, Your Honor.

The Court: Very well.

By Mr. Darby:

Q58. Let me put it this way: In the first place, Dr. Olsen, in the structure, Defendant's Exhibit L, is the cap heated when the device is in operation?

The Court: Do you mean in a gas stove?

636 Q59. In Exhibit L. A. I judge it would be.

Q60. It would have to be, wouldn't it? A. Yes, in order to function.

Q61. When it is heated does its heat serve the purpose of keeping the kerosene above the flash point? A. Yes.

Q62. Now, is there any teaching in the Rutz patent to that effect? A. No, there is no necessity of heating.

Q63. Is the teaching in Rutz diametrically opposed to that? A. Yes.

The Court: I do not think any question exists but that Rutz was intended for lighting gas jets and not for lighting purposes. The only question is are the two far apart or not? Are the two arts far apart or not? That would be for argument later on, of course. 637

Mr. Darby: We have gone as far as we can on that, Your Honor.

The Court: Take Rutz and assume it would work as a torch—

Mr. Wisner: I think that one of the very important things we have to decide here is whether a transfer of this device to a flare is 638
something that becomes an invention or not. I think that is an important question in this case.

Mr. Darby: All we can do is to bring to bear as much evidence as we can to be of aid to the court. To a man skilled in the art, does that amount to an invention? And we have gone as far as we can, we have produced the inventor who was trying for two years to develop something like that.

Cross Examination by Mr. Wisner:

639

XQ64. The first time you ever had any experience with one of the devices such as exemplified by Plaintiff's Exhibit 19 was when Mr. Withrow came and talked to you recently? A. Yes.

XQ65. Before that you had never done any work with kerosene open flame torches? A. No, not an open flame torch.

The Court: How long ago?

The Witness: He came about February the 10th, or something like that.

XQ66. Less than a month ago? A. Yes.

640 XQ67. And all of your experiments and knowledge that you have with reference to these devices in the prior art have been acquired since February the 10th? A. Right, except, of course, my general knowledge of combustion and flames.

XQ68. Now, will you explain the nature of the tests to which you subjected the devices? A. What do you want me to start with?

XQ69. You tested for 40 mile an hour winds, I believe? A. I think there was three series of tests that I carried out. If you wish me to give you those in order, I will do it.

641 XQ70. Did you make any memorandum of the results of the tests? A. Of course.

XQ71. And have you those memoranda? A. I have a copy of the reports with all the figures and everything else.

XQ73. Now, when you were subjecting these two devices to a 40 mile an hour wind, what color was the flame? Did you observe that? A. As the wind velocity increased, the flame became bluer.

XQ74. And it was quite blue at 40 miles an hour? A. Yes.

XQ75. Did you make any measurements of its
642 candle power at that stage? A. Yes.

XQ76. And what were the results of your candle power measurements? A. You asked 40 miles?

XQ77. Yes. A. I did not make any at 40 miles.

XQ78. In wind tunnel tests at 40 miles an hour, how far did you place the burner cap from the end of the wind tunnel? A. I said I made tests at 30 miles an hour.

XQ79. I understood you to say on direct examination that your tests were made at 40 miles an hour? A. I might have tested them to see if they would burn at 40 miles an hour.

XQ80. Did you? A. Yes. 643

XQ81. And did they burn at 40 miles an hour? A. They did.

XQ82. With what kind of a flame? A. With a bluish flame, I should say.

XQ83. And what is the temperature of a blue flame? A. The maximum temperature of a blue flame with gas is 1735 degrees Centigrade. I have melted a fine platinum wire in the tip of a Bunson burner blue flame, and the melting point of platinum is given as 1735 degrees Centigrade.

XQ84. And this is the same type of flame that you found in this torch at 30 miles an hour? A. 644 Yes.

XQ85. A blue flame? A. Yes.

XQ86. Having approximately that temperature—that is, you can tell a flame temperature roughly by its color? A. I would not want to say definitely.

XQ87. Well, approximately? A. It might have been 100 degrees or so off.

XQ88. Well, plus or minus 100 degrees, it was 1700 degrees temperature then? A. Well, you are asking me to make an estimate of a flame, a kerosene flame at 40 miles an hour. Now, that is something of a guess. I never tested the temperature 645 of that flame.

XQ89. Did it occur to you? A. Why should I?

XQ90. You were not asked to test that? A. I saw no reason to test it.

XQ91. Now, down to 30 miles an hour velocity, what sort of a flame had you there? A. It was bluish in character, some blue, some white.

XQ92. Did you make any measurements of the temperature of that flame? A. No.

XQ93. Did it occur to you that it might be some-

646 thing that would have some bearing on the operation of the device? A. No.

XQ94. And from what source does the heating of these two caps about which you have testified, come about? A. From the flame.

XQ95. And suppose we remove the caps entirely from the structure of this type. The flame still has a high temperature, does it not? A. It would probably blow out.

XQ96. I asked you what its temperature was. A. I could not give the temperature if the flame is gone.

647 XQ97. I said in an open flame, from a wick, what temperature has that flame? A. That depends on what you mean by open flame. I don't know what you are talking about.

XQ98. Take one of these torches and take off the flame guard, light it and you get a flame, don't you? A. Yes.

XQ99. And in circumstances of that kind, what is it which vaporizes fuel? A. The heat of the flame.

XQ100. And what is the temperature of that flame, assuming that we are in still air? A. It is

648 quite a little below the temperature that I have given for a blue flame. It is probably two or three hundred degrees below.

XQ101. And much hotter than any observation you made on the metal caps? A. Oh, yes.

XQ102. You measured those temperatures? A. Yes.

XQ103. I believe the metal cap in certain instances was as much as 200 or 300 degrees? A. I can give you that exactly, if you want it.

XQ104. Please do. A. Well, the highest tem-

perature of the cap that I obtained was 718 degrees Fahrenheit. 649

XQ105. And whose torch was that? A. That is on the Anthes torch.

XQ106. And what was the wick extension that we used then? A. I think it was ⅛th of an inch.

XQ107. And what were the air conditions? A. None. That is, there was no wind, still air.

XQ108. And where was that measurement taken, from what portion of the cap? A. The entire cap. I will tell you just what I did. I quickly removed the cap and immersed it in water, with a thermometer, so as to know the temperature, and then 650 I noted the temperature of the water when it reached maximum, and then I calculated the temperature of the cap which would be the average temperature of the whole metal of the cap.

XQ109. But whether or not there was a cap, there would be a heat beating down from the flame onto the top of the wick, would there not—any condition of any type of burner or structure? A. There is a certain heating of the flame, but about the heat beating down on it—I don't agree with that.

XQ110. Well, where does the heat come from in 651 an open flame torch, without any cap, which keeps kerosene vaporizing? A. There is a flame immediately around the cap. That is where the flame starts.

XQ111. I am talking about without a cap. A. There is a flame immediately around the wick that is burning, and that is in rather close contact with the wick, and that flame heats the wick. Now, the rest of the flame which is above the wick has very little to do with heating the wick.

652 XQ112. You are familiar, of course, with the old kerosene lamp? A. Yes.

XQ113. With a chimney? A. Yes.

XQ114. And the wick is usually a flat one? A. sometimes flat, sometimes round.

XQ115. Well, we are talking now about a flat one—trimmed down very closely to the wick, wasn't it? A. Yes. You could regulate it for light by moving it up or down.

XQ116. And between the top of that wick and the beginning of the visible flame there is a space? A. There is a little zone there that burns blue.

653 XQ117. And that is a gas space? A. On the outside it is combustion.

XQ118. There is a space in which the vapors of kerosene heated by the flame in there are intermixed with air and without that co-operation between the air and the kerosene vapors, there can be no flame? A. Inside of the flame you will have no combustion, but you will always have a combustion zone on the outside where the air immediately comes in. It may be rather narrow, but it is there.

XQ119. Between the wick and the flame? A. On the outside of the flame.

654 XQ120. On the outside of the flame? A. Yes.

XQ121. And is it burning directly from the wick? A. Right over the wick there are unburned gases. You can put a tube in there and draw off unburned gases on the inside of the flame, but on the outside of the flame you have a narrow zone of combustion which is blue and further up in the flame you get the color.

XQ122. I believe you said the blue was hotter than yellow? A. Ordinarily.

XQ123. So that portion closer to the wick is a little bit hotter than the portion somewhat removed from the wick? A. I should judge so.

XQ124. In what path does radiant energy travel? 655
A. In a straight line.

XQ125. So radiant energy is developed in all directions from that flame? A. Yes.

XQ126. And the shortest path to travel from the top of the wick, in radiation of the flame is downward? A. You would have radiation, of course, from all parts of the wick.

XQ127. The art is replete with examples of air chambers for mixing the air with the fuel vapors; they have been known ever since Argand first pointed out their pertinency, have they not? A.
Yes, most burners have something of that sort. 656

XQ128. So there is nothing new in such a chamber to mix the oxygen and fuel from the kerosene, or whatever the fuel may be, the vapors from the kerosene? A. That particular fact is well known, yes.

XQ129. Now, to go back to this 40 mile an hour wind velocity, Doctor. Will you take the wand and point out on Fig. 1 of Defendant's Exhibit B through what orifice or opening that wind was blowing? A. You mean this figure here?

XQ130. Yes, Fig. 1 of Exhibit B. A. You would,
of course, have the wind pressure on all of these 657
openings that are exposed to the wind.

XQ131. It would be roughly equal up the entire side of all the cap? A. The wind pressure would be the same all around it.

XQ132. And the wind would be coming in the flame openings more than in the air openings, would it not? A. They are larger, of course more would go through.

XQ133. Was there any metering of air in the device under such conditions? A. No.

XQ134. I understood you to say that one of the

658 important features of this device was to measure the air so that exactly the right amount was mixed with the fuel. A. No, I didn't say that; you misunderstood me.

XQ135. It has no such function as that? A. Well, the size of these openings is designed to control the burning conditions.

XQ136. At what air velocity? A. Well, at the air velocity it is to function.

XQ137. At whatever air velocity it may meet, whether it be 40 miles an hour or zero? A. Yes, that is one of the difficulties of the design. You
659 have got to make a design that will function under all air velocities up to 40 miles. That is one of the remarkable things about this.

XQ138. At 40 miles an hour a tremendous amount of air is pouring in through what formerly was the flame opening, certainly a great deal more air was pouring in through the flame opening than through the air inlet? A. Of course, it is larger, and it is unrestricted, so naturally you will have wind going through here, and of course the flame is blown out on the other side.

XQ139. Also cut through the opposite air ports?
660 A. Of course it is, so that your flame by the air velocity is carried outside beyond the burner, and of course it is very much shortened because you are mixing the gas with the air, so it is burning and burning well, you see.

XQ140. Did you observe the operation of the Withrow structure, Fig. 1 of Exhibit B, in still air? A. Oh, yes.

XQ141. Did you make any measurements of its candle power? A. I think I did.

XQ142. What was the result of that measurement? A. No, I have no measurements of that;

I have measurements from 20 to 30 miles an hour. 661

XQ143. Only in that range? A. I have them in that range, yes, sir.

XQ144. Did you make any observations of the Anthes device in still air? A. No, no, I also took that from 20 to 30 miles.

XQ145. You only observed that during the range of from 20 to 30 miles an hour? A. Yes; I had the two at 20 to 30 miles.

XQ146. Do you remember, Doctor, Dr. Luckiesh's testimony with reference to how much light that Withrow device produced in still air? A. I remember he gave it very low. 662

XQ147. You made no observation, however, of that, did you? A. No.

XQ148. Would you say that Dr. Luckiesh was wrong? A. From my work, from looking at it, I would say he was pretty low.

XQ149. You were seeking to measure it with your eye? A. Just observed it; it didn't seem to me it was anything like as low as he said, but that was just an observation, you understand; I didn't measure it.

XQ150. You notice, of course, some structural difference between the Anthes structure, Fig. 2, 663 and the Withrow structure, Fig. 1 of Exhibit B? A. Why, there are some slight differences, yes.

XQ151. The Anthes structure is mounted on a wick tube, is it not? A. Yes.

XQ152. At a 40-mile-an-hour breeze, that breeze is blowing by the wick tube, is it not. A. Undoubtedly.

XQ153. What effect would that have on the temperature of the wick tube? A. Well, that is a little hard to say. The conductivity of air is very low,

664 that is, the amount of heat which is carried away by an air current is very low.

XQ154. At a 40-mile-an-hour velocity, however, it can convey a great deal of heat away from that wick tube, can it not? A. At a 40-mile velocity your flame is intense and hot itself, so that if you take the summation of the two, which is the only thing you get in this case, the differences wouldn't be very great.

XQ155. You made no measurement which would enable you to give any precise statement of what happened? A. Oh, yes, yes, I measured. Yes, I
665 measured the temperature of the cap and the temperature of the wick at 40 miles.

XQ156. Did you measure the temperature of the wick tube? A. Yes, sir.

XQ157. What was that temperature? A. Well, at 40 miles an hour the Toledo flare gave—

XQ158. I am asking you about the Anthes? A. All right, I beg your pardon. At 40 miles an hour the Anthes flare gave a cap temperature of 414, and a wick temperature of 160.

XQ159. Where was that wick measurement made? A. The wick measurement was made by in-
666 serting a thermometer right in this point, you see (indicating), squeezing the wick apart and putting the bulb of the thermometer right up in there.

XQ160. Pointing to the left hand side of the wick tube on Fig. 2 of Exhibit B? A. That is right.

XQ161. Then you got a measurement of 155 degrees. A. 160 degrees.

XQ162. 160? A. Yes, 160 degrees from the Anthes flare.

XQ163. The bottom flange of the Anthes structure is perforated with holes, is it not? A. Yes, right at 6 here, pointing to Fig. 2, 6 on the other side of Fig. 2.

XQ164. In still air what would be the course 667
of the air current which is being fed to the wick
in the Anthes structure? Will you point it out on
the drawing? A. You would have a slight air current passing up and out through the openings 3.

XQ165. And what would be the course of the air current in still air on the Withrow structure, Fig. 1 of Exhibit B? A. It would come in here—

XQ166. From the side? A. What is that?

XQ167. You are pointing out that it comes in
from the side, are you not? A. Yes, in the air
opening 10, as well as the other air openings, and
then as soon as it mingled with the hot gases it 668
would pass up and go out the opening 9.

XQ168. You made some mention of the transmission of heat in these two structures. The holes which you referred to in the bottom of the Anthes structure have a tendency to restrict this transmission of heat, do they not? A. I am not so sure of that because you have radiation here from the flame right straight down, which might make up for any other conditions.

XQ169. You are talking about the conduction,
as I understand it, through the metal part of the
flame guard? A. But in this case you also have, 669
because you have an opening there, you also have
radiation from a hot flame.

XQ170. And that radiation from the hot flame is beating particularly on the top of the wick more than it is on the holes in the flange at the bottom of defendant's structure, is it not? A. Well, it is passing out everywhere, wherever there is a straight line, so you have radiation on plate 8, Fig. 2.

XQ171. The air that is being fed in through those holes, as you pointed out, also has a tendency

670 to cool that flange, does it not? I am referring to the portion marked 4 on Fig. 2 of Exhibit B. A. That ordinarily is so slight that I do not think you can measure it.

XQ172. You made no attempt to measure it. A. No, I just measured the temperature of the kerosene in this wick, which would give me an idea—

XQ173. You made no attempt, however, to measure the temperature of the air before it went through the flame guard and after it came out of it? A. That was ordinary temperature, room temperature.

671 XQ174. Was it room temperature when it came out? A. Of course it would be hot when it got out of there.

XQ175. I thought you said air had very little conductivity for heat. A. I said that, yes.

XQ176. And it was hot nevertheless when it came out of the structure? A. Surely, it was in the flame; how could it help but be hot?

XQ177. Now, this Rutz structure about which you testified, I understood you to say in your opinion it could not be used as a satisfactory warning signal. Did you ever try it as a warning
672 signal? A. No, sir.

XQ178. When you stated to the court that in your opinion it could not be used, that was what might be termed an intelligent guess? A. I was talking about this structure over here.

XQ179. You said that that particular structure, in your opinion, would not be usable as a warning signal. A. I doubt if I said that; I do not remember saying that.

XQ180. What is your opinion about it now? A. I would want to test it out before I gave an opinion on it.

XQ181. You made no test of it? A. No, I made no test of it. 673

XQ182. You are aware that the structure used as a cap on Exhibit L is a device manufactured by the Milwaukee Gas Specialty Company in accordance with the Rutz patent? A. I will take your word for it.

XQ183. It was, I will say that. Are you still of the opinion that it would not satisfactorily operate as a flare? A. I would want to test it out and find out. I do not know whether that will stand high wind velocity or will give much light, whether the openings are big enough for the flame or whether 674
the openings for the gas down there are sufficient I do not know about that.

XQ184. Do you consider the only difference between the structure of the patent in suit and Rutz is one of whether the Rutz holes should be larger? A. Well, there is an awful lot of difference between that structure and this, even as it stands.

Mr. Darby: When you say that, you point to Fig. 3.

XQ185. Which? A. Fig 3. This is designed for gas flames to shoot out, and presumably it is satisfactory for that purpose. 675

XQ186. They are both for the burning of vapor? A. After you once produce the vapor in this case, and you have a vapor ready in this case under pressure.

XQ187. Do you consider that any material difference? A. I absolutely do.

XQ188. What is the difference? A. You do not have to have any wick, or you do not have to have any container for your oil, you do not have to vaporize the oil, you do not have to provide for a flame coming out; there are lots of things that are different.

676 XQ189. However, it can be used to take care of all of those purposes, can it not? A. It can be used for the purpose for which it was designed, and used satisfactorily, that is what I understand about it.

XQ190. You do not know what other purposes it might be used for? A. I do not know. I know it is a flash igniter for a stove, and it is used for that purpose.

XQ191. Have you ever seen one in operation? A. Well, I have one on a gas stove at home.

XQ192. Did you ever place your finger on top
677 of it when it was operating? A. I never did test it, no.

XQ193. You do not know whether it gets hot or not? A. I couldn't tell you.

XQ194. The flame is a blue flame, is it not, from the gas? A. Not in mine; it is a light flame.

XQ195. In your burner at home? A. Yes.

XQ196. Have you any idea what its temperature is? A. I do not know. I could test it, but I have not done so. There is no reason why I should.

XQ197. The heat from that flame is rising, is it not? A. You mean from the little pilot flame
678 inside?

XQ198. Yes. A. That is a very small flame.

XQ199. Nevertheless it is hot? A. Yes, it is hot, but the total amount of heat is very small.

XQ200. It rises nevertheless? A. Yes.

XQ201. It is going on all the time? A. There are little air currents that will go up here.

XQ202. And the top of the burner would naturally get hot? A. Well, you have a large amount of surface there and you have a very small amount of heat.

XQ203. As a matter of fact, Professor, it is a

good deal more important for Rutz to have a fool- 679
proof structure than Withrow to have his fool-
proof for his conditions? A. Yes.

XQ204. His flame could not go out, because if it did, there would be danger of escaping gas? A. You would smell it.

XQ205. Yes, but you might not be there? A. Then it would not do any harm.

XQ206. It would cost you a lot of maney? A. No, not necessarily.

XQ207. You made no measurements or observa-
tions whatsoever of the Rutz structure either oper-
ating as a flare? A. No. 680

XQ208. All you were testifying about with reference to that structure is what you guessed about it? A. I wouldn't say that, no.

XQ209. You have no opinion then as to what wind velocity that Rutz burner would stand? A. I could give you a guess. You seem to like guesses.

XQ210. No, I disregard them entirely. I should very much prefer to have data. A. I have already told you that I haven't tested it, so the only thing I could do is to give you a guess.

XQ211. I do not care for any guess, so we will
withdraw the question. A. Well, we will settle it 681
on that basis.

XQ212. I show you a copy or a model of the Malcov structure, Defendant's Exhibit I.

The Court: As I recall it, I understand the witness, I may be in error, is in disagreement about this, he says that this does not quite represent it, there are four openings, and I think he said he believed the patent offered two.

Mr. Wisner: I want him to point out on the

682 drawing eventually, Judge, under what theory he gets only two openings.

The Court: All right.

XQ213. Did you ever observe that structure in operation? A. No, sir, I did not.

XQ214. In testifying about its operative characteristics you were only telling what you thought about it, not what you knew about it? A. Right, using my experience, and so forth.

XQ215. I now hand you the drawing of the Malcov patent No. 1163 of the year 1868; the figure at the bottom of page 1 is a side elevation, is it
683 not? A. I believe so.

XQ216. In a side elevation it would only show two air inlets on the side from which the elevation is taken, would it not? A. Unless the front part is where the air goes in. I can conceive that this would be the metal on this side, and this the opening (indicating). In other words, I can conceive that this is metal, and that this is open space, and this metal goes across and makes the top.

XQ217. Now just a moment— A. Yes, sir.

XQ218. The entire portion in which the dots are shown in this structure is a solid piece of metal
684 except for these minute openings? A. Well, of course you have drawn it here according to your conception of this thing, but if I should draw it according to my conception I would put the wings on each side and I would extend those across and make the top.

XQ219. You would put a dome across the top? A. Yes, with these two wings.

XQ220. And on the side there would be— A. Metal.

XQ221. Metal? A. Yes, sir, on two sides. That

is just a matter of speculation, because it is not 685
very clear.

Mr. Wisner: I ask that the witness' voluntary statement be stricken out as not responsive to any question.

The Court: He just said it is a matter of speculation. Do I take your testimony that you couldn't say whether there are two or four openings on this?

The Witness: Two or four supports for the perforated top. I do not think it would make a great deal of difference.

The Court: That isn't the question, 686
whether it would make any difference.

The Witness: As I read the patent, I conceive that these two wings being of metal, and this being the opening, then these would be connected across the top with a metal with perforations in it.

XQ222. In draftsmanship, Professor, it is customary, is it not, to have a heavy line on the right-hand side of the drawing and a lighter line on the left, on the theory that the light comes down over the left shoulder? A. Maybe so.

XQ223. You do not know whether that is the 687
fact? A. No, I couldn't testify as to what the custom is in Russia.

XQ224. You notice, however, on what is marked in the patent, an arc marked D on the left-hand side of the structure, there are two lines, one light and one heavy? A. Yes, I notice that.

XQ225. And the right-hand line is heavy? A. Yes.

XQ226. And on the arc marked D on the right-hand side of the structure— A. Yes.

XQ (continuing)—there are two lines? A. Yes.

688 XQ227. And the most right line, the one most to the right, is a heavy line? A. Yes.

XQ228. And the other line is a lighter line? A. Slightly lighter, yes.

XQ229. You will further notice the two lines in the middle of the structure, the one on the right is lighter than the one on the left? A. The one on the right is a much lighter line; you can hardly see it.

XQ230. Are you experienced in mechanical draftsmanship? A. Not much.

XQ231. You made some reference to the Argand
689 patent. Among other things, you pointed out that he prescribed a chimney or pipe— A. Yes.

XQ (continuing)—which surrounded the flame? A. Yes.

XQ232. He also prescribes a dome, does he not? A. I do not recall the dome that he described; that I do not recall.

XQ233. However, the portion marked 8 in Fig. 1 of Defendant's Exhibit B, the metal top, might be referred to as a dome, might it not, without doing any violence to the meaning of the word "dome"? Does the word "dome" describe that structure on
690 the top? A. Oh, it might, yes; you might use that word.

XQ234. Were you asked any questions about Defendant's Exhibit J, a model of the Salsbury structure? I do not remember. A. I do not believe I was; I do not think I was.

XQ235. You never made any tests of such a structure as this Exhibit J? A. No.

XQ236. You are not informed as to its operative qualities? A. No.

The Court: Apparently the open tops, that is an open one, isn't it?

The Witness: Yes, open top. 691

The Court: Apparently none of the open ones would work in bad weather, that is, where you have a lot of rain.

Mr. Wisner: Some of the testimony has been an inordinate amount of rain; our testimony is that this one worked perfectly in a snow storm.

The Court: I am talking about rain.

Mr. Wisner: Extraordinary rain.

The Court: Just the rain that you get on a highway.

Mr. Wisner: I admit very frankly, Your Honor, that the rain, heavy rain, would put this one out, but for most purposes it would perform its operations. 692

The Court: I do not think that you now seriously contend that that is an anticipation.

Mr. Wisner: It shows every thing but a metal top.

The Court: That is the question. We are going to narrow this issue down, I think, when we get through, pretty close to Rutz here.

Mr. Wisner: I told Your Honor in the beginning that Rutz was something that we wanted to keep our eye on all the way through. 693

The Court: Those where you have an open flame, in rain on a highway, and you do get rainstorms—

Mr. Wisner: Oh, yes, I admit that.

The Court: They will put the light out; isn't that so? If you apply rain there it will put that light out?

The Witness: Surely.

Mr. Darby: I might say, Your Honor, it might be helpful to say that that is really the

694 issue here, Rutz. And that was the issue in the Sixth Circuit, Kahn, I think his name was, showing exactly the same thing. So whether it is Rutz or Kahn, the issue narrows right down to that proposition.

XQ237. It is true, is it not, Professor, that the metal parts of all kerosene lamps which are constructed to use kerosene become hot during the operation? A. No, it isn't true.

XQ238. In what case is it not true? A. The metal parts in contact with the flame would undoubtedly get warm, depending on their contact
695 with the flame. The metal parts not in contact with the flame would not get hot.

XQ239. It would not be possible to prevent a wick tube from getting hot, would it, in a kerosene lamp? A. There are patents that try to keep that from getting hot by insulating it.

XQ240. You say "try"? A. Well, doubtless they are more or less successful in preventing the wick tube from getting hot. There are conditions where they think that is necessary to do that in their design.

XQ241. Ordinarily, however, without some par-
696 ticular attention being directed to insulating or some other feature of that kind to prevent the wick tube from becoming hot, it becomes hot as a matter of course? A. You can design a thing for it to become hot, and you can design for it not to become hot, prevent it from becoming hot, and you can leave it alone to take its own course. You can do any one of those three things.

XQ242. And if you wanted to transmit heat, get it hotter, if that performs any useful function, you can use copper? A. There are various reasons why we use copper and why we do not use copper.

We use steel in the chemical industry a hundred times instead of copper, when we transmit heat; we do that continuously under present-day practice. 697

XQ243. Steel has good qualities for transmitting heat? A. It is a good conductor of heat, and it has other qualities which copper does not have.

The Court: Is Kahn the same in effect as Rutz?

Mr. Darby: May I approach Your Honor with this?

The Court: Certainly.

Mr. Darby: The Kahn patent is in evidence, and without taking the time to read it to you— 698

The Court: I just want to know. You seem both to agree on it, so we won't have to waste much time on that.

Mr. Darby: You see, it is just the same thing, it is virtually the same in every essential respect as the Rutz patent.

Mr. Wisner: I might say that the evidence shows that Rutz superseded Kahn shortly after Kahn went on the market, and has been universal ever since.

XQ244. Now, when you are making comparative tests, Doctor, the most accurate scientific comparisons are obtained by using two devices, are they not? A. Using what? 699

XQ245. Two devices exactly similar. A. It depends entirely on what you are doing.

XQ246. Suppose you want to compare the operation of a pair of flares, one without a burner cap and one with a burner cap; the most accurate results are obtained if you eliminate the most variables, are they not? A. It depends on what you are testing. You will have to state the conditions

700 before you can have me answer that question.

XQ247. Suppose you want to determine their performance. A. Well, you still haven't told me why you take the cap off.

XQ248. Because you want to determine the performance with the cap and without the cap. A. If that is worth doing I would do it, but I still don't know why I do it.

XQ249. You eliminate a variable by using the same torch body, do you not? A. Well, you may want to have variables in.

XQ250. In any test of performance you want at
701 least two variables, do you not? A. Why, if the variables are inherent to the device, you want them in, you do not want to throw them out, because you want to know what those variables will do.

XQ251. How many variables can you measure? A. There may be a dozen of them.

XQ252. All at the same time? A. Yes.

XQ253. And can you accurately draw inferences from a dozen variables that you are measuring? A. If you wish the performance of a piece of equipment that is designed and operating, you want to take the whole thing as it is and then find
702 out what it will do.

XQ254. You can't possibly find out what it will do unless you measure the variables one at a time, can you? A. If you are trying to design the thing, that may be a different story, but if you trying to find out what it will accomplish, you have to take it as it is, that is the only way you can do it.

XQ255. And measure all the variables simultaneously? A. You note them, yes. You may note a half a dozen things if they are pertinent, yes.

XQ256. In your observation of the performance of the two flares, one belonging to the plaintiff and

the other to the defendant, you measured only wind 703
resistance? A. Well, if I want to get fuel consumption as against wind resistance, why, I would measure the two.

XQ257. Yes. A. But there would be a number of variables that I found here, and therefore I used duplicates, I used three flares of each kind to find out if the three identical flares, so-called identical, would give me the same results, and I found that they did not.

XQ258. Have you your figures on the operation of the Withrow torch where you used three flares?
A. Yes, sir; yes sir. 704

XQ259. Did each of the flares withstand the same wind? A. Let me get my figures and I will answer your question. These experiments were conducted under outdoor conditions where they were subject to the wind velocities that happened to come and go during that day.

XQ260. I am asking you now about those which you stated you measured. You say they were subjected to a 30-mile wind; did they all withstand that? A. You are talking about fuel consumption?

XQ261. No, I am talking about withstanding
wind for the Toledo flare. A. Withstanding wind 705
in what respect?

XQ262. You said you subjected them to wind tests. A. You will have to tell me what you are trying to get at. I do not know what it is.

XQ263. I want you to answer my question, did you subject the Toledo flare to wind tests? A. I can't answer that question.

XQ264. Did you subject the Anthes flare to any wind tests at any time? A. I can't answer that question.

706 XQ265. Did you subject anything that was submitted to you to any tests? A. Yes.

XQ266. And were one of those tests wind tests? A. No.

XQ267. You subjected them to no wind tests? A. No, as I understand you. I do not know what you are talking about, but as I understand you, my answer is no.

XQ268. Did you subject them, or did you make tests of them in which wind was one of the variables which you were considering? A. Yes.

XQ269. You did that for the Toledo flare? A.
707 I did.

XQ270. For three of them? A. I did.

XQ271. At 30 miles an hour? A. Under the conditions prevailing outdoors.

XQ272. You measured the wind outdoors? A. I took it from the Weather Bureau.

XQ273. Where were these flares set? A. At the Polytechnic Institute, on the fire escape, about the fourth floor.

XQ274. Where is the Polytechnic Institute—that is in Brooklyn? A. Yes.

XQ275. And where is the Weather Bureau
708 located in Brooklyn? A. I do not know.

XQ276. You do not know at what elevation above the ground? A. No.

XQ277. And you do not know anything more than the Weather Bureau said there was a 30-mile wind somewhere in the vicinity of New York? A, Yes.

XQ278. And you assumed it was a 30-mile wind, is that it? A. No.

XQ279. I thought you said you subjected it to a 30-mile wind. A. I didn't say that.

XQ280. You simply tested it when somewhere

in New York there was a 30-mile wind blowing? 709
A. I tested them for a day when I had a lot of wind blowing, sometimes strong, sometimes weak, and I have a record of the Weather Bureau as to what the velocities were on that day, and I suppose I had varying wind conditions, and they were all exposed alike. I measured the fuel consumption under those practical conditions to find out if they operated alike.

XQ281. Isn't the Weather Bureau on top of the Whitehall Building at Bowling Green? A. It may be so.

XQ282. You do not know whether it is so or 710
not? A. And I do not care.

XQ283. That is a twenty-five story building? A. Possibly.

XQ284. You do not know? A. I do not know.

XQ285. Are those the only measurements of wind velocity that you made? A. No.

The Court: When did you make that test?

The Witness: This was made, I do not know, maybe a couple of weeks ago; it was during that period when there was heavy wind.

The Court: We have had a lot of wind
around here; it was blowing people's hats all 711
over the street, I remember seeing a man's hat blowing all the way down to Borough Hall. Whether it was on that day or not, of course, I do not know.

The Witness: It was a couple of days during that period when we had heavy wind that we made that test.

The Court: Ten days or two weeks ago we had quite heavy wind; whether it was on that day or not, I do not know; we had a lot of wind around here.

712 XQ286. You measured neither of these devices under wind velocities of less than 20 miles an hour, did you? A. I believe not. I will check and see. I do not think I did.

XQ287. So— A. Unless these outdoor tests, they probably had less than 20 miles an hour at times.

XQ288. So in your testimony on direct examination you are not seeking to cover anything other than wind between 20 and 30 miles an hour? A. I will admit that that is what they cover.

XQ289. And that you determined by the report
713 from the Weather Bureau for that day? A. No, some of these tests were made in a wind tunnel.

XQ290. That is what I was getting at; which tests were those? A. All right, sir, I will tell you. The measurements of the temperature of the cap and the wick were made in the wind tunnel at 20 and 40 miles, and also—

XQ291. At 20 and 40? A. 20 and 40, that is, the measurements of the cap temperature and the wick temperature were 20 and 40, and quiet conditions in the laboratory with practically no wind. I also have measurements of illumination or light
714 given off at 20, 25 and 30. They were also made in the wind tunnel.

Mr. Wisner: Are these the same that were put in evidence when Mr. Close testified?

Mr. Owen: No, they are not; I think they are different. Those were made at Toledo, and these the doctor is speaking of were made here in New York.

XQ292. All of the fuels that were used for devices such as Withrow and as Rutz are hydrocarbon fuels, are they not? A. Well, as far as Withrow and Anthes are concerned, they are

hydrocarbons; so far as Rutz is concerned, there 715
are some hydrocarbons in gas, but there are also other constituents which are not hydrocarbons, so that Rutz could not be said to have been made with hydrocarbons, because there are some other constituents in gas.

XQ293. What are those constituents in gas which are not hydrocarbons? A. For instance, there is hydrogen and there is carbon monoxide.

XQ294. Those are both constituents of hydrocarbon gas, are they not? A. They are not hydrocarbons.

XQ295. Do I understand you that when the gas 716
is vaporized the oxygen is burned in a flame? A. I do not understand your question.

XQ296. You said that hydrogen and carbon dioxide— A. Carbon monoxide.

XQ (continuing)—were not to be found in a hydrocarbon gas? A. They are not hydrocarbons.

XQ297. However, oxygen and carbon are both found in hydrocarbon, are they not? A. Hydrocarbons consist of oxygen and carbon combined.

XQ298. In various mixtures? A. Yes, in a number of proportions.

XQ299. The things that give the illuminating 717
quality to the gas in such a device as Rutz or a gas jet in your house are the hydrocarbons, are they not? A. You are entirely right.

XQ300. They give the luminescence? A. Yes, they are about—

XQ301. They cause—

Mr. Darby: Let the witness answer.

The Witness: Gas contains about 12 or 13 per cent of those hydrocarbons.

XQ302. They are the ones which give the luminescence to any flame? A. Give the light, but be-

718 ing only 12 or 13 per cent, you have a very different situation than where you have 100 per cent, that is a ratio of 1 to 8, so you have got a different story.

XQ303. You have examined the test data of Professor Croft? A. Yes, I have read it.

XQ304. In your tests were you seeking to disagree with his observations, that is, at velocities of less than 10 miles an hour? A. I do not think his tests amount to much.

XQ305. I am not asking you about that, I am saying are your tests supposedly comparable with
719 those run by Professor Croft? A. They were run for a different purpose entirely.

Re-direct Examination by Mr. Darby:

RDQ306. Just one question. With reference, Dr. Olsen, to the particular tests where you put a number, one or more of these flares out on a fire escape on the fourth floor of the Institute, what was the purpose of that test? A. I wished to ascertain the fuel consumption of these flares under practical conditions, particularly on a windy day, to see what
720 they would burn.

RDQ307. And how many burners of the plaintiff's type did you use? A. I had three Toledo flares.

RDQ308. And how many burners of the defendant's type did you use? A. Three of the Anthes flares.

RDQ309. Was it your object to subject them to identical conditions? A. That was my purpose.

RDQ310. Were you the least bit concerned with the velocity of the wind for that purpose? A. No.

RDQ311. You did, however, take the trouble to

ascertain what the Weather Bureau report of 721
windage was for that particular day? A. Right.

RDQ312. What was it. A. At 7 A. M. it was 19 and at 7:20 P. M. it was 20 miles an hour.

RDQ313. You stated a minute ago that you did not think that Professor Croft's test amounted to much? A. Yes.

RDQ314. Please state your reason. A. He made a comparison with the flares with and without a cap, and I do not think that showed any—I was not interested in knowing what they did without a cap. He also tested at a very low wind velocity,
something under 8 or 9 miles an hour. 722

RDQ315. Referring again to this fire escape test for fuel consumption, what did you find was the average fuel consumption of the three Anthes flares and the three plaintiff's flares? A. The Anthes flare gave me results in ounces of fuel consumption per hour of 2.34, 1.76 and 2.14, and the average of those is 2.05.

RDQ316. What was the average of the others? A. 1.95.

RDQ317. For whom? A. For the Toledo and 2.05 for the Anthes. You see, they are very close
to two ounces. There is very little difference. 723

Re-cross Examination by Mr. Wisner:

RXQ318. These figures that you have just submitted on fuel consumption were acquired by measuring the device before you started lighting it and after finishing? A. Yes.

RXQ319. There were no measurements taken during the period of how much fuel it was consuming? A. No.

724 RXQ320. The measurement was by weighing the device? A. Yes.

RXQ321. And there are differences in size of the torch bodies of the two structures? A. The Anthes and Toledo flares were all alike. They differ somewhat, of course.

RXQ322. In size? A. Yes, I think so.

RXQ323. And no constants were kept of the amount of fuel level? A. We filled them all full at the start and we let them run.

RXQ324. And that is all the data you have on fuel consumption? A. Of course, I have it on other
725 flares. I have the data on the flares with the great big wick on them.

RXQ325. Did you make any tests at any time on the road or street? A. No.

RXQ326. They were made either indoors or up on the fire escape? A. Yes.

RXQ327. You do not recognize, I assume, that still air ordinarily prevails outdoors? A. Not by my observation.

RXQ328. Have you ever seen a fog? A. Yes.

RXQ329. And a fog is a thing which greatly impedes the passage of light? A. Yes.

726 RXQ330. And ordinarily in a fog it is practically still air, otherwise there would not be a fog? A. Not much movement.

RXQ331. It is the most dangerous condition you can have on the road? A. I don't know whether I should say that.

RXQ332. However, it is replete, is it not, with possibilities for accidents? A. It is better, of course, when it is clear, but whether it is the worst condition or not, I do not want to say.

RXQ333. If you wanted to determine how to go about to ascertain an increase of efficiency that

results by placing a flame guard on this structure, how would you do so? A. I might not be interested in determining that. 727

RXQ334. Suppose you were asked to work on that problem. A. If I was asked the problem to determine the efficiency of a flare with and without a cap, I should immediately want to have a flare that would be satisfactory and operate under practical conditions, and then I would take a flare designed with a cap on it and compare those two. I would not take a cap off a flare and leave other things the same.

RXQ335. You would not be interested then in eliminating all possible variables, you would want to interject as many possible variables in your testing as you could? A. I would determine how that flare operated and resisted a 40-mile-an-hour wind, and after that—that is not the state of mind I would be in when I carried out the experiment, no. I would not take in any more variables than necessary. 728

RXQ337. You admit it is desirable to eliminate variables in a performance? A. It depends upon what testing you are carrying out.

RXQ338. If you were going to carry out an efficiency test on this structure to see what the effect of the addition of a flame guard would be, to do so and to have any scientific accuracy to that test, you would want to keep the size of this body constant? A. You will have to tell me just what efficiency test I would be interested in carrying out. 729

RXQ339. You are competent to make an efficiency test? A. I would determine first what the device is to be used for and what purpose it must have to be useful, and then find out how well it

730 performs that function, and that I would call efficiency.

RXQ340. Is that the recognized mechanical engineering definition of efficiency? A. Yes.

RXQ341. The definition of "efficiency" and the only proper definition is how much you get out of what you put into it? A. Not necessarily.

RXQ342. What other definitions are there? A. I just gave you a definition. Find out what the device is to be used for and then ascertain how well is fulfills that particular function, whatever it may be, and then you will know what its effi-
731 ciency is.

RXQ343. Do you recognize Kent's Mechanical Engineer's Pocket Book as a standard work? A. Surely.

RXQ344. On page 12 of the Edition of 1913, the definition of efficiency is defined as follows:

"Efficiency is defined in engineering as the quotient 'output divided by input', that is the energy utilized divided by the energy expended." A. That is a particular test made for a particular use. I have a handbook of my own which is just as authoritative as that, and I am just as capable
732 of telling you how you test for efficiency as Mr. Kent is,

RXQ345. Suppose you wanted to get the candle power of this device per ounce of fuel consumed per hour, how would you do it? A. If I was interested in that, I would make a test of the candle power and the fuel, and if you wanted it per hour, I should probably make a number of candle power tests throughout the hour, to be sure I had an average or mean which represented any differences that might occur from time to time. I would weigh it before and after, and then I would get candle

power per ounce of fuel consumption. 733

RXQ346. Then you would have the device's efficiency, would you not? A. In that particular respect, yes.

By Mr. Darby:

RDQ347. What is the name of your handbook, Doctor? A. It is the Chemical Annual. D. Van-Nostrand's Chemical Annual, and I am the editor of it.

RDQ348. And what other books have you written? A. I have written a book on quantitative analysis, which has been printed in several editions, also qualitative analysis, and have a textbook on 734
chemical engineering. I have a book on foods. I have edited 17 volumes of translations of the American Institute of Chemical Engineering.

By Mr. Wisner:

RXQ349. Do any of them discuss the subject of lighting or flares? A. In the chemical engineering book we have to discuss fuels and their consumption, but we did not come down to flares. We thought that was a rather simple subject.

The Court: I am going to think out loud, just to narrow the issues. I do not usually do this in patent cases, and, of course, it is sub- 735
ject to revision later on. I do not think much of this claim as to infringement, I think the language that Judge Hahn used here is particularly applicable. I think the real question here is one of validity and I think the Rutz patent is one that will have to be considered seriously. I suppose so far as the covering of a fire is concerned, I suppose from the time that we have had fires, they have realized that it is well to cover the fires to protect it from the weather. I think it can be narrowed down considerably.

Plaintiff's Exhibit No. 1

248

Oct. 22, 1929. J. E. WITHROW ET AL 1,732,708.

BURNER

Filed Dec. 26, 1928

Fig. 1

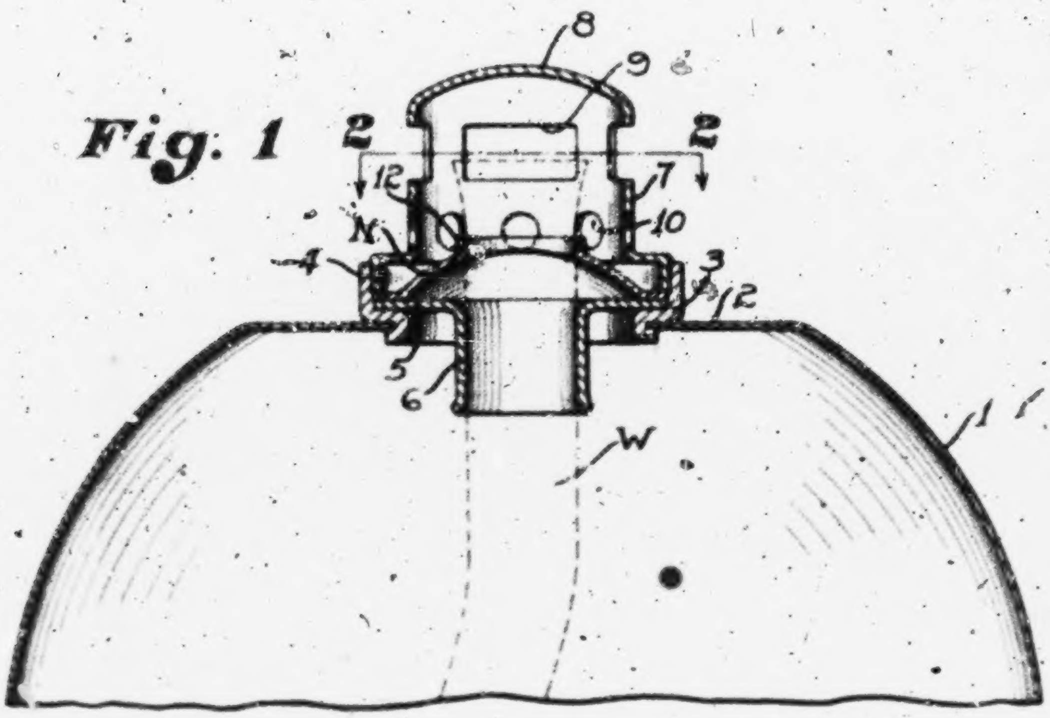


Fig. 2

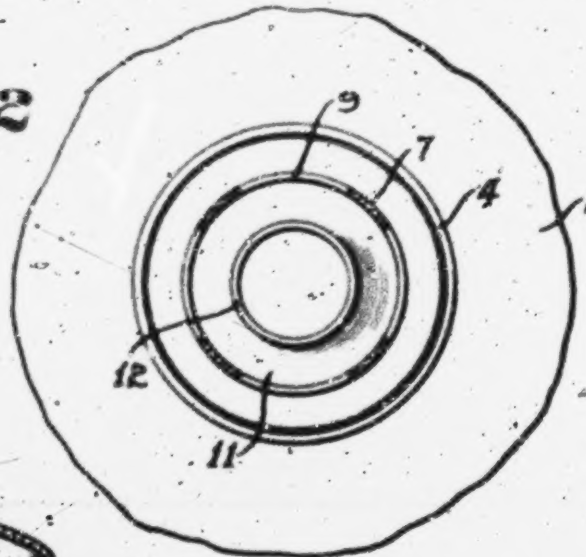
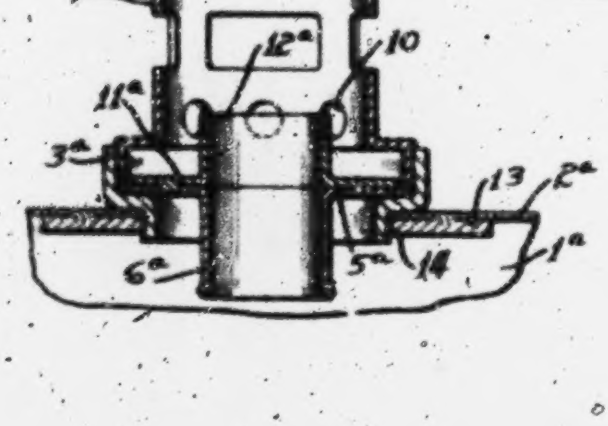


Fig. 3



Joseph E. Withrow
Lyman W. Close

By

1,732,708

Patented Oct. 22, 1929

UNITED STATES PATENT OFFICE

JOSEPH E. WITHROW AND LYMAN W. CLOSE, OF TOLEDO, OHIO, ASSIGNORS TO THE TOLEDO PRESSED STEEL COMPANY, OF TOLEDO, OHIO, A CORPORATION OF OHIO

BURNER

Application filed December 20, 1926. Serial No. 328,432.

This invention relates to street torches, such as are commonly used for illuminating road obstructions, and usually referred to as construction torches, but more particularly to devices for increasing the efficiency of such torches and militating against extinguishment of the torch flame, and an object is to provide a simple and efficient attachment for torches of the above character for increasing the efficiency thereof and materially reducing the liability of extinguishment of the flame by high winds. Another object is to provide a burner so constructed and arranged that liability of extinguishment of the flame by high winds or by rain is reduced to a minimum. Further objects are to provide a device of the above character which may be inexpensively manufactured and has the new and improved features of construction hereinafter described.

The invention is shown by way of illustration in the accompanying drawings, in which:

Fig. 1 is a vertical sectional elevation of a torch with the device applied thereto;

Fig. 2 is a transverse sectional view on the line 2—2 of Fig. 1; and

Fig. 3 is a vertical sectional elevation of an alternate form of burner.

The illustrated embodiment of the invention comprises a sheet metal torch 1 of substantially frusto-spherical shape having an opening for a wick in its upper end 2. Crimped over the edges of such opening is a member 3 having an outwardly extending annular flange 4, which is internally threaded. Resting on the shelf formed by the member 3 is a disc like member 5 having a central tubular extension 6, which projects inside of the torch body 1 a substantial distance. A wick W is adapted to extend through the extension 6 and to be held in position thereby.

Screwed onto the threads of the annular flange 4 is a cap 7, which extends inwardly from the flange 4, and then upwardly. The upper wall 8 of the cap 7 is imperforate, and as shown, is dome shaped. Formed in the side walls of the cap beneath the end wall 8 is a series of relatively large rectangular openings 9 through which the flame of the torch passes. Beneath the openings 9 are series of relatively small air ports 10, through which air passes to the inside of the cap for the torch flame. It will be observed that the cap is of such dimensions that the side walls thereof are spaced from the sides and end of the wick W.

Resting upon the disc shaped member 5 is an arched disc 11 having an upwardly extending annular flange 12 terminating in the region of the air ports 10. As shown, the upper end of the extension 12 covers approximately one-third of the area of the ports 10. The function of the disc 11 is to prevent the air entering the inside of the cap 7 from cooling the wick W to such an extent that the temperature of the oil passing up the wick is reduced below the desired point.

When the outer end of the wick W is lighted the oil passing up the wick by capillary action is heated, thereby maintaining the oil in the region of the outer end of the wick at the proper flashing point. This heating of the wick is facilitated by the reflection of heat from the dome-shaped cap and by conduction to wick-holding collars 12 and 6 from their supporting flanges, flange 11 receiving reflected heat and being in contact with the lower edge of the heated cap. Air inlet openings 10 being above the lower edge of the cap leaves a space within the cap and above the flange of the wick holder for comparatively quiescent air. This quiescent layer of air in contact with the wick holder and the restriction of inlet ports to admit to the wick and holder only such air as is needed for combustion aids in maintaining the heat of the wick holder and wick. This militates against extinguishing the flame by high winds. Sufficient cool outer air is supplied to the end portion of the wick through the ports 10 for securing a satisfactory flame, and the latter extends through the openings 9 to provide a satisfactory signal. It has been found that with the above described construction and arrangement the oil consumption is materially decreased. It is also found that the amount of wick used is likewise decreased. Another outstanding advantage resides in reducing the liability of extinguishing the flame by high winds or rain.

In the embodiment shown on Fig. 3, there is fixed, as by welding to the torch body 1ª, a ring 13 which surrounds the opening in the top wall 2ª and the walls of the opening are formed with screw threads 14 to receive a flanged member 3ª. This permits the burner to be attached to or detached from the torch as a unit. In this form the disc 5ª has an inwardly extending wick-receiving tube 6ª, and fixed to the upper surface of the disc 5ª is a disc 11ª provided with an upwardly extending flange or tube 12ª. The upper end of the flange 12ª covers approximately one half of the openings 10 of the cap 7. It will be understood that the arrangement of tubes 6ª and 12ª may be used to advantage in the form shown in Fig. 1.

While we have shown and described constructions which admirably fulfill the objects primarily enumerated, it is to be understood that the above description is given by way of illustration and not of limitation, and numerous changes in details of construction and arrangement may be effected without departing from the spirit of the invention, especially as defined in the appended claims.

What we claim as new and desire to secure by Letters Patent is:

1. In a device of the class described, a torch body having an opening at its upper end, a wick-receiving tube extending into said opening, and a cap disposed on the outer side of said torch body to enclose the outer end of the wick, said cap having an imperforate upper wall, lateral flame openings, and air openings below the flame openings.

2. In a device of the class described, a torch body having an opening for a wick, and a flame guard for said wick mounted on the outside of said torch body, said guard including a cap provided with an imperforate top wall and lateral flame openings adapted to emit a luminescent flame, and air ports.

3. In a device of the class described, a torch body having an opening for a wick, an outwardly extending flange in the region of said opening, and a flame guard detachably connected to said flange and comprising a cap provided with side flame openings and air ports.

4. In a device of the class described, a torch body having a wick opening, an outwardly projecting flange in the region of said opening, a wick-receiving tube extending inside of said torch body, and a guard for the outer end of the wick engaging said flange, said guard comprising a removable cap having an imperforate top, side flame openings and air openings.

5. In a device of the class described, a construction torch having an opening in its upper end for a wick, means to hold the wick in place, and a guard fitting over the outer end of the wick but spaced from the sides thereof, said guard having an imperforate top w[all] and side flame and air openings.

6. In a device of the class described, a torc[h] body having a wick-opening, a tube for re[-] ceiving the wick and adapted to exten[d in-] side of the torch body, an outwardly extend[-] ing flange in the region of said wick-openin[g] and a cap connected to said flange and havin[g] an imperforate top wall, said cap having [a] flame opening adjacent its outer end and a[n] air port beneath said flame opening.

7. In a device of the class described, a torc[h] body having a wick-opening, a cap for e[n-] closing the outer end of the wick but spac[ed] from the sides thereof, an imperforate e[nd] wall for said cap, said cap having a seri[es] of flame openings and a series of air ports b[e-] neath the flame openings, and a disc adapt[ed] to embrace the wick and having a flang[e] upper portion disposed in the region of sa[id] air ports.

8. In a device of the class described, [a] torch body having a wick opening, an out[-] wardly extending flange in the region of sa[id] opening, a wick tube extending inside of sa[id] torch body, a cap adapted to enclose t[he] outer end of the wick and engaging sa[id] flange, an imeprforate end wall for said ca[p] said cap having a series of flame openi[ngs] and a series of air ports beneath said fla[me] openings, and a flanged disc adapted to em[-] brace the wick and having its upper e[nd] disposed adjacent said air ports.

9. In a device of the class described, [a] burner unit adapted for attachment to [a] torch, said unit comprising a supporti[ng] member for engagement with a torch bod[y] a wick-holding member having opposite[ly] extending flange portions for embracing [a] wick, and a cap superposed upon said sup[-] porting member, said cap being provid[ed] with vertically spaced air-inlet and fla[me-] outlet openings.

10. In a device of the class described, [a] burner unit adapted for attachment to [a] torch, said unit comprising a supporting member for engagement with a torch body, a wick-holding member having oppositely extending flange portions for embracing a wick, and a cap superposed upon said supporting member, said cap being provided with vertically spaced air-inlet and flame-outlet openings, the upper end portion of one of said flange portions covering approximately one-half of said air-inlet openings.

11. A burner for a construction torch adapted to emit a luminescent flame and comprising a wick holder having a portion in contact with the wick and a supporting and heat-receiving flange, and means enclosing a space above said flange and surrounding the wick, except for provision for lateral exit of flame and restricted entrance of air for combustion.

12. A burner for a construction torc[h]

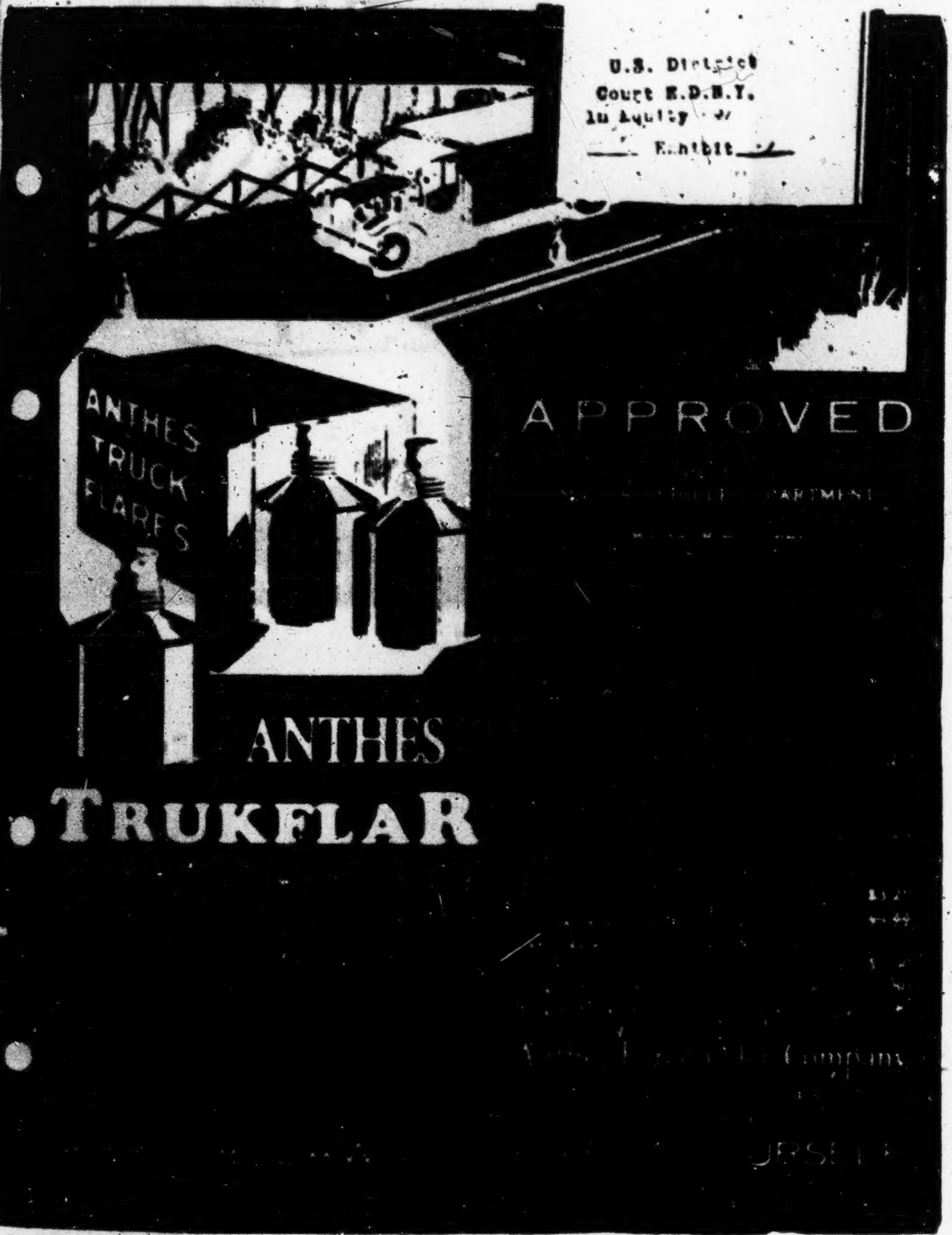
adapted to emit a luminescent flame and comprising a wick holder having a portion in contact with the wick and a lateral flange, and a cap enclosing and spaced from the end of the wick and having an imperforate top and provision for lateral exit of flame and entrance of air, and the bottom of the cap being in heat conducting relation to said flange.

13. A burner for a construction torch adapted to emit a luminescent flame and comprising a wick holder having a portion in contact with the wick and a laterally extending flange and a cap over the wick, the cap having an imperforate, dome-shaped top wall, a lateral flame opening approximately even with the top of the wick and a smaller opening for the inlet of air lower than the flame opening and above the lower edge of the cap, said lower edge being in heat-transferring relation to said flange.

14. A construction torch adapted to emit a luminescent flame and comprising a fuel receptacle with an opening in its top, a wick extending upward through said opening, a wick holder having a collar holding the wick and a flange resting in said opening, and a cap screwed into said opening and against said flange, the cap surrounding and being opened from the end of said wick, having an imperforate, dome-shaped upper wall, lateral space for the exit of flame adjacent said wall, and restricted inlet for air beneath said space.

In testimony whereof we have hereunto signed our names to this specification.

J. E. WITHROW.
LYMAN W. CLOSE.


U.S. District
Court E.D.N.Y.
In Equity
Exhibit
ANTHES
TRUCK
FLARES
APPROVED
ANTHES
TRUKFLAR

U.S. District
Court E.D.N.Y.
In Equity
Exhibit

• The new safety regulations of the Interstate Commerce Commission specify that each truck or bus under its regulation which does not operate entirely on well lighted roads or highways shall carry at least three oil-burning flares in a carrier, at least two red flags and at least three oil burning fusees.

• You can meet these requirements by equipping your vehicle with the new No. 53F Toledo Truck Flare Kit. Each oil burning flare in this kit will burn under any weather conditions for more than the time required by these regulations, and will also exceed all other requirements of the law.

• The flags in this kit are of the required size and are made of durable, fast color material.

• The fusees are made in accordance with the specifications of the Bureau of Explosives and are so printed on their labels. Although the requirements are satisfied with 3 fusees which burn only 15 minutes, here are 3 fusees which each burn 30 minutes.

• The fusees are installed in a steel tray which is carried at the top of the case, or may be removed and hung up on the wall of the cab.

• The case is a well styled container made of heavy gauged steel, in which all sharp corners have been eliminated and care has been taken to give it a quality finish in keeping with the honest value of the entire unit. It may be attached in any desired location or position, or carried by a convenient handle. A spring latch keeps the cover shut and provides a place for a padlock, if desired.

No. 53 F

THE TOLEDO PRESSED STEEL COMPANY

TOLEDO · OHIO

Parts List and Specifications

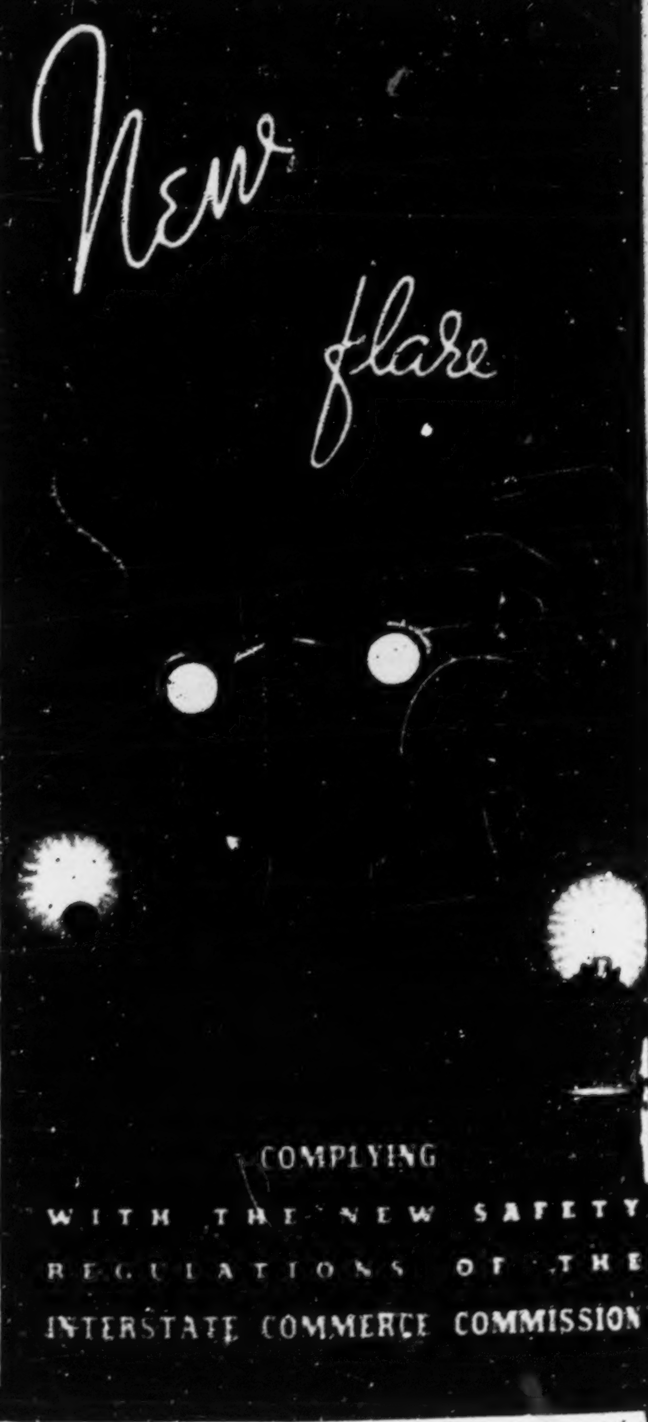
No. 5—Single TOLEDO Truck Flare only, capacity 48 oz., burns 16 hours or more on one filling; 20 gauge steel; provided with seal-tight snuffer cap; red enamel finish.

No. 711A—Red flag and staff to use in socket on cap to flare.

No. 30—30 minute red burning fusee.

No. 779—Steel Case only, equipped with brackets to hold fusee tray, hinged cover, spring lock and handle.

No. 337—Complete combination set, composed of steel container, three oil flares, three flags and staffs and one tray holding five 30 minute fusees. Shipping weight 18 lbs.


New flare
COMPLYING
WITH THE NEW SAFETY
REGULATIONS OF THE
INTERSTATE COMMERCE COMMISSION

How to Operate Number 5 TOLEDO TRUCK FLARES

Equipped with the ECONOMY BURNER

Read Directions Carefully

The No. 5 Toledo Truck Flare consists of four principal parts: the shell or reservoir for the oil; the wick and wick holder assembly; the hood, which is perforated with four small round holes (air ports), and four large oblong holes (flame ports); and the snuffer cap.

Flare No. 5 Complete

The flares are contained in a steel case that fully encloses them and is proportioned so that the flares will fit the case in any position. In either horizontal position the flares are carried side by side. In the vertical position the flares are carried on top of each other—always right side up.

To attach the case to the vehicle, knock-out the four attachment holes in the bottom and fasten the case to the vehicle in the desired position by means of screws or bolts.

To put the No. 5 Toledo Truck Flare into operation:

1. *Remove the Snuffer Cap.*

A slight twist to the left will release the bayonet lock attachment. The gasket in the snuffer cap seals in the oil against leakage. The cap will not lock without the gasket. Do not disturb the gasket.

2. *Remove the Hood and Wick-holder with Wick.*

The hood is attached to the shell with a threaded joint. Remove the wick and wick-holder by grasping the top of the wick.

3. *Fill the Reservoir with Good Kerosene.*

The flare reservoir has a capacity of 48 ounces when filled to within a quarter of an inch of the center hole level. This will give about sixteen hours of continuous burning service under average conditions.

4. *The Wick Should Project About 1/8 of an Inch.*

Cap

The flange end of the wick-holder is the top end. The tube end projects downward into the reservoir. For best operation and longest service per filling, the wick should extend above the flange only about 1/8 of an inch. A prong in the wick tube prevents downward movement of the wick. If the wick extends too far above the flange, pull the wick through the wick-holder from the top side and thread it through the bottom end again to the proper adjustment.

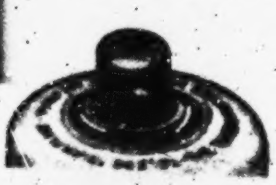
5. *Insert the Wick into the Flare Reservoir.*

When wicks are new they are stiff and the wick-holder flange must be forced down to a seat. After use this condition will be corrected. Do not twist the wick in the reservoir to secure a seat for the wick-holder as this may disturb the wick adjustment.

6. *Attach the Hood.*

Screw the hood down tightly against the wick-holder flange. A lead of 1/20 of an inch is provided in the thread to give good leverage and insure a tight contact between the hood and wick-holder. Be careful not to jam or cross the thread.

7. *Ignite the Oil on the Wick Through a Flame Port.*



Detail Showing Top of Flare

The Toledo Truck Flare operates on a heat reflection and vaporization principle. Be sure that the burner parts are fully heated before leaving the flare after lighting. When properly heated the burner will function without further attention, regardless of weather conditions.

8. *To Extinguish the Flame Use the Snuffer Cap.*

Dropping the snuffer cap over the hood will extinguish the flame. Lock the snuffer cap tightly in position by a right hand twist and the contents will be securely sealed against leakage while being carried.

9. *Clean Off the Carbon.*

In normal operation a deposit of carbon will occur on the hood, wick, and wick-holder. This carbon should be cleaned off before the next period of use. This can most thoroughly be accomplished by removing the hood and wiping the parts, including the tip of the wick. Keep the air ports clear of carbon.

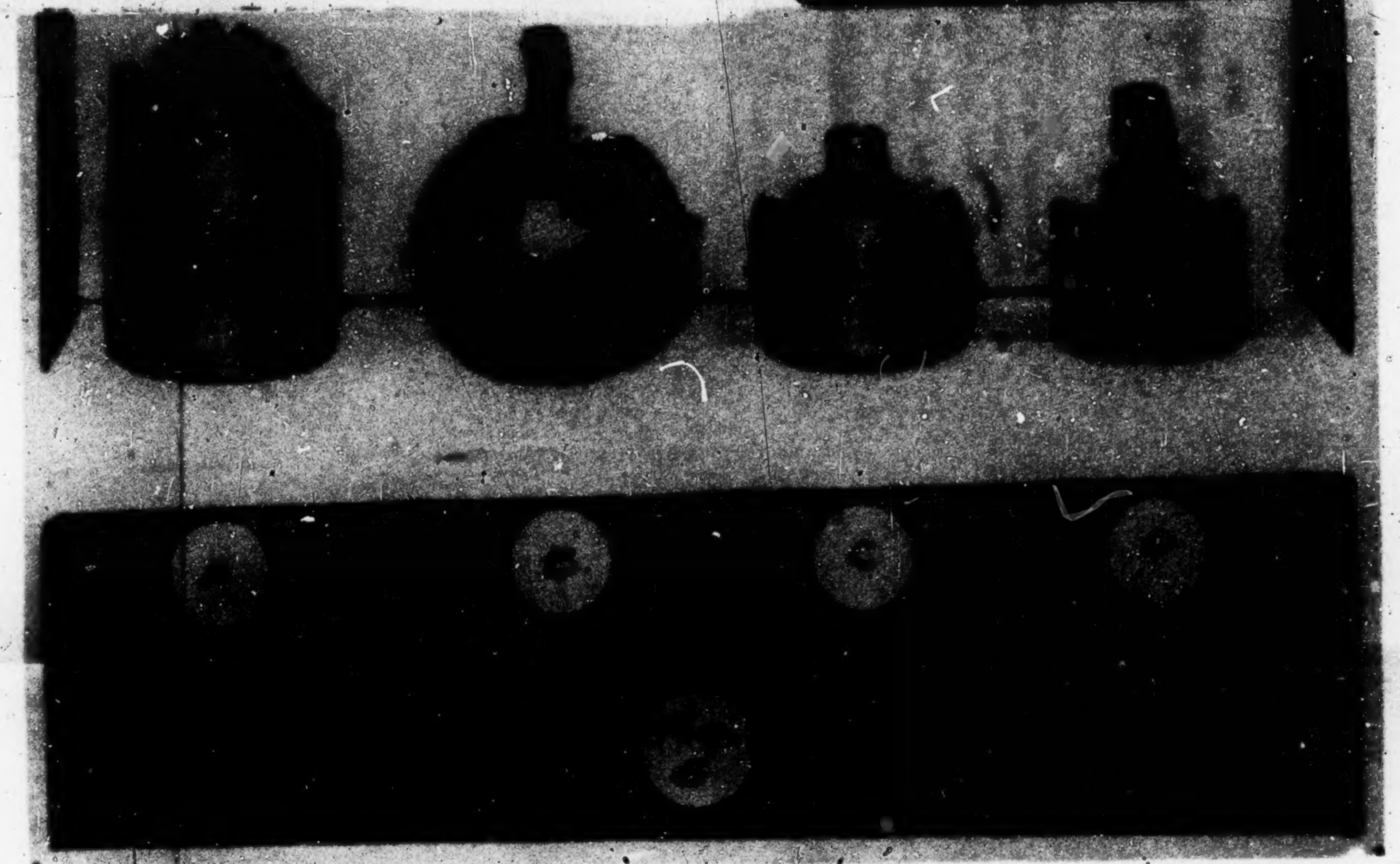
In refilling the flare, it is good practice to blow off bits of carbon that may rest on top of the wick-holder, before uncovering the reservoir. This is to prevent contaminating the oil and clogging the wick. It is also good practice now and then, when refilling, to first empty the flare completely of its contents to get rid of water and other residue which may remain from the oil which has been used.

The Toledo Pressed Steel Company • Toledo, Ohio

U.S. District
Court E.D.N.Y.
In Equity 5417
Pl. Exhibit - 8

PLAINTIFF'S EXHIBIT NO.8

PHOTO OF TORCHES AND FLAMES REFERRED TO IN EXHIBIT 14.
(A) DETROIT 3-WICK TORCH.
(B) FIRST TOLEDO OPEN-FLAME TORCH
(C) TOLEDO TRUCK FLARE OF PATENT IN SUIT.
(D) ACMES TRUCK FLARE.



THE

TOLEDO TORCH

The only real protection for open construction work at night.

The minimum protection required by law (red lanterns) is not sufficient to keep you out of personal injury suits. But—

YOU ARE SAFE
with

THE TOLEDO TORCH

Note the sturdy, substantial construction. Rigid pressed steel with a cast iron weight welded into the bottom—it is always self-righting. No matter how it is kicked or tumbled about, like a cat it always lands right side up.

Nothing to break; so distinctive it will never be stolen. The use of

THE TOLEDO TORCH

eliminates a big and constant item of expense.

Simple to operate, no globes to clean. Just fill with kerosene and light. Put TOLEDO TORCHES around the open work or in the holes you leave. No barricades are needed.

No one can mistake the warning of this signal. Its ruddy flame is seen from a greater distance, it instantly attracts attention. The TOLEDO TORCH gives enough light to see all the danger.

Seven inches in diameter, holds seven-tenths of a gallon of kerosene. The TOLEDO TORCH will burn all night anywhere, at any time, in any kind of weather. It is an all-purpose danger signal.

Used by state and county highway departments, cities, public utilities, road builders and progressive contractors — everywhere. To them The Toledo Torch has proven the economical solution of a troublesome and expensive problem.

Jan. 11, 1927. 1,613,819

L. W. CLOSE

TORCH

Filed August 6, 1926

Fig. 1.

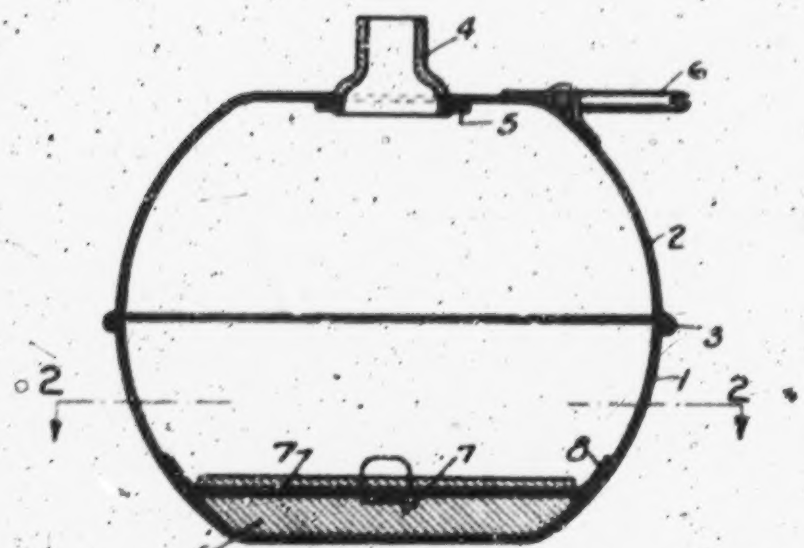


Fig 2

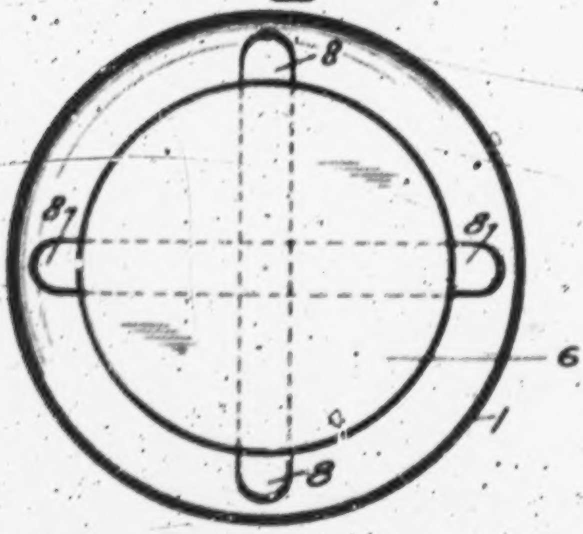


Fig. 3.

INVENTOR

Lyman W. Close

BY Owen & Owen

ATTORNEYS

1,613,819

Patented Jan. 11, 1927.

UNITED STATES PATENT OFFICE.

LYMAN W. CLOSE, OF TOLEDO, OHIO, ASSIGNOR TO THE TOLEDO PRESSED STEEL COMPANY, OF TOLEDO, OHIO, A CORPORATION OF OHIO.

TORCH.

Application filed August 6, 1926. Serial No. 127,692.

This invention relates to torches but more particularly to torches of the type used in connection with road repair or construction work for danger signals, and an object of this invention is to provide a torch with a counter weight for maintaining the torch in upright position which is mounted in the torch body in a simple and efficient manner enabling such counter weight to be fixedly secured in place readily and cheaply. Further objects and advantages will hereinafter appear.

The invention is shown by way of illustration in the accompanying drawings, in which—

Fig. 1 is a vertical sectional elevation of a torch embodying the invention; Figure 2 is a section on the line 2—2 of Figure 1; and Figure 3 is a detail sectional elevation of an alternate form.

The illustrated embodiment of the invention comprises a torch of sheet metal having a body portion formed of two parts, a base part 1 and an upper part 2. The bottom and top of the torch body are flattened and the side walls are rounded. In this instance, the adjoining edges of the top and bottom parts are seamed together as shown at 3. Formed centrally in the top of the upper part is an opening into which fits a spout or nozzle 4 screwed into a ring 5 spot welded to the inside of the torch body. A handle ring 6 may be suitably connected to the side of the torch to facilitate handling.

In torches of this character, it is highly desirable to provide a counter weight so that at all times an upright position is maintained and so that the torches are self-righting should they be knocked over. As shown a counter weight 6 is placed in the bottom of the torch body and is shaped to conform to the side walls of the torch body.

For securely holding the counter weight in place a pair of straps 7 spot welded together is embodied in the counter weight with the ends 8 projecting therefrom. The counter weight 6 may be cast around the straps so that a unitary arrangement is formed. The projecting ends 8 of the strap are bent upwardly to lie flat against the inner wall of the torch body. These ends are preferably spot welded to the torch so that the counter weight 6 is fixedly secured in place.

In the alternate form shown in Figure 2, the counter weight 6ᵃ is similar in shape to the counter weight 6, but instead of utilizing straps to hold it in place, a cup-shaped member 9 rests against the top of the counter weight and has its edge portions 10 bent to conform to the inner wall of the torch body. The edge portions are spot welded at intervals to the torch so that relative movement between the counter weight 6ᵃ and torch body is prevented.

While I have described my improved torch in more or less detail to comply with the requirements of this statute, it is nevertheless desired that this detailed description be considered merely as illustrative and not as limiting, and it is to be understood that changes and modifications may be made by those skilled in this art without departing from the invention as defined in the following claims.

What I claim is:

1. A torch comprising a body having a flat base and curved walls, a counter weight inside of said body and conforming to the side walls thereof, holding means extending across the upper portion of said counter weight, and upwardly bent end portions on said holding means to conform to the inside of said body, said upwardly bent portions being rigidly secured to the inside of said body thereby to hold said counter weight against movement.

2. A torch comprising a two part body, the lower part having a flat base and curved side walls, the upper part having curved side walls and a flat top, a seam connecting said parts together, a nozzle in the top of said upper part, a counter weight in said lower part having sides conforming to the shape of the side walls of the body, straps embedded in said counter weight, and upwardly bent end portions on said straps projecting beyond the ends of said counter weight and lying flat against the body, said bent end portions being secured to said body.

3. A torch comprising a two part body, the lower part having a flat base and curved side walls, the upper part having curved side walls and a flat top, a seam connecting said

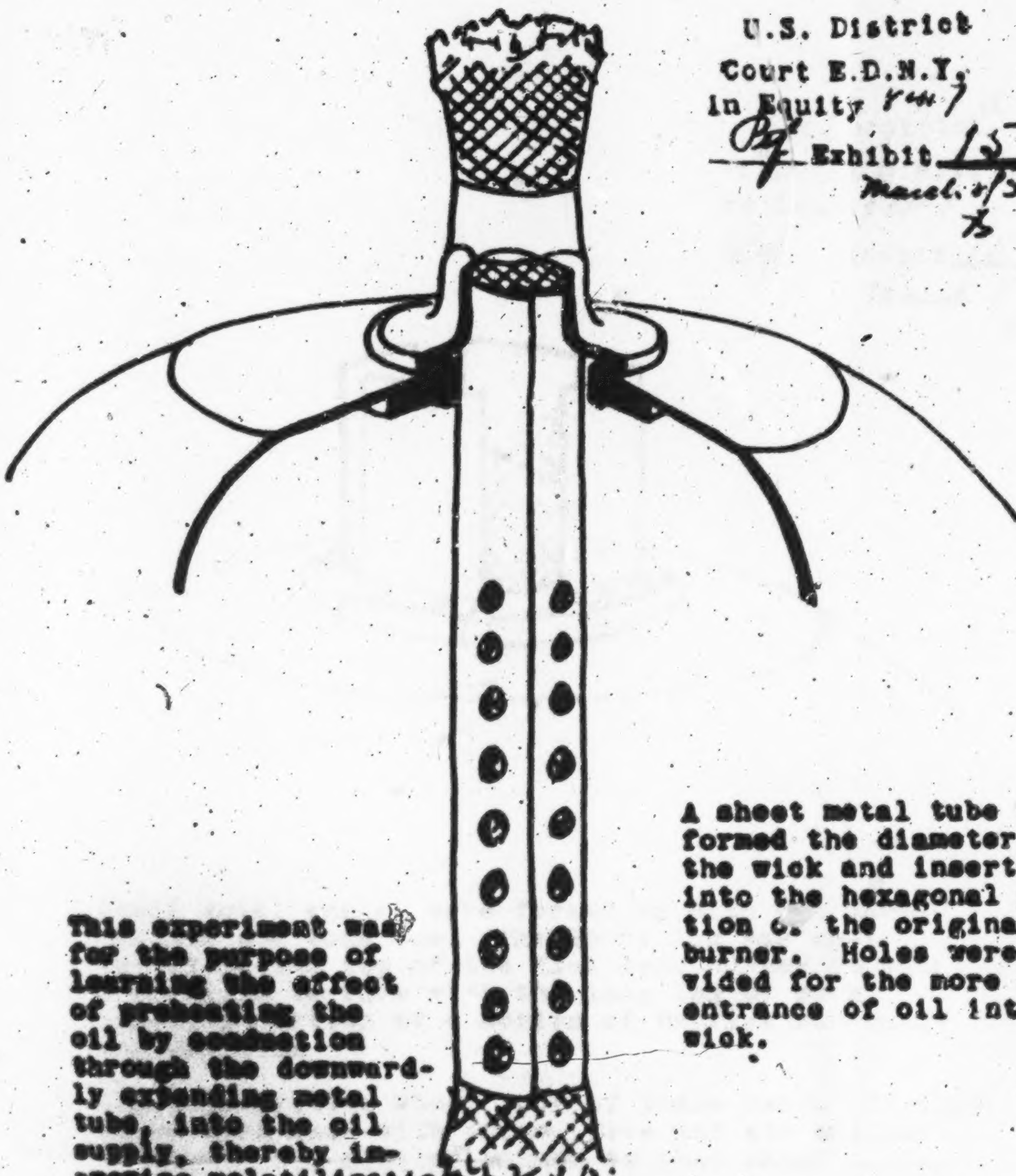
parts together, a nozzle in the top of said upper part, a counter weight in said lower part having sides conforming to the shape of the side walls of the body, a retaining member engaging the upper portion of said counter weight and upwardly bent edges on said member conforming to the shape of the inner walls of said body, said upwardly bent edges being rigidly secured to said body thereby to retain said counter weight in place.

In testimony whereof I have hereunto signed my name to this specification.

LYMAN W. CLOSE.

1

U.S. District
Court E.D.N.Y.
In Equity 8447
Pl'f Exhibit 15
March 8/58

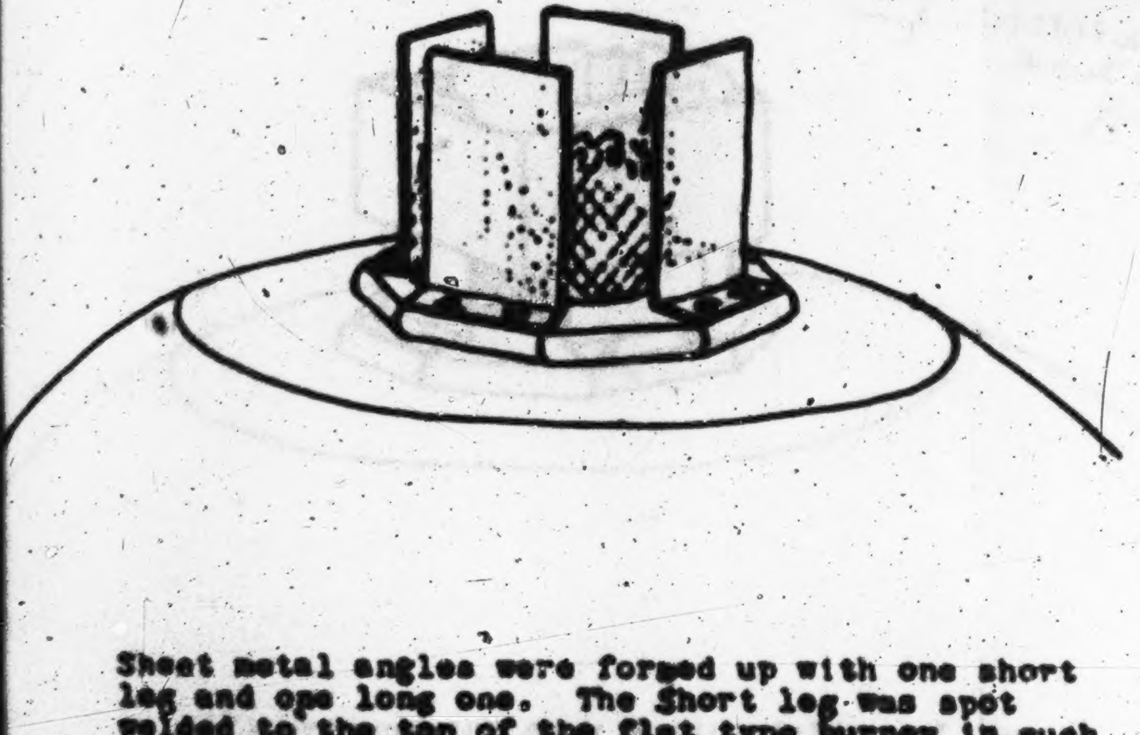


A sheet metal tube was formed the diameter of the wick and inserted into the hexagonal portion o. the original burner. Holes were provided for the more easy entrance of oil into the wick.

This experiment was for the purpose of learning the affect of preheating the oil by conduction through the downwardly expanding metal tube, into the oil supply, thereby improving volatilization and consequently improving combustion and making the flame more reliable in cold and windy weather.

It had merit but was impractical to produce.
This taught us that preheating oil was desirable.

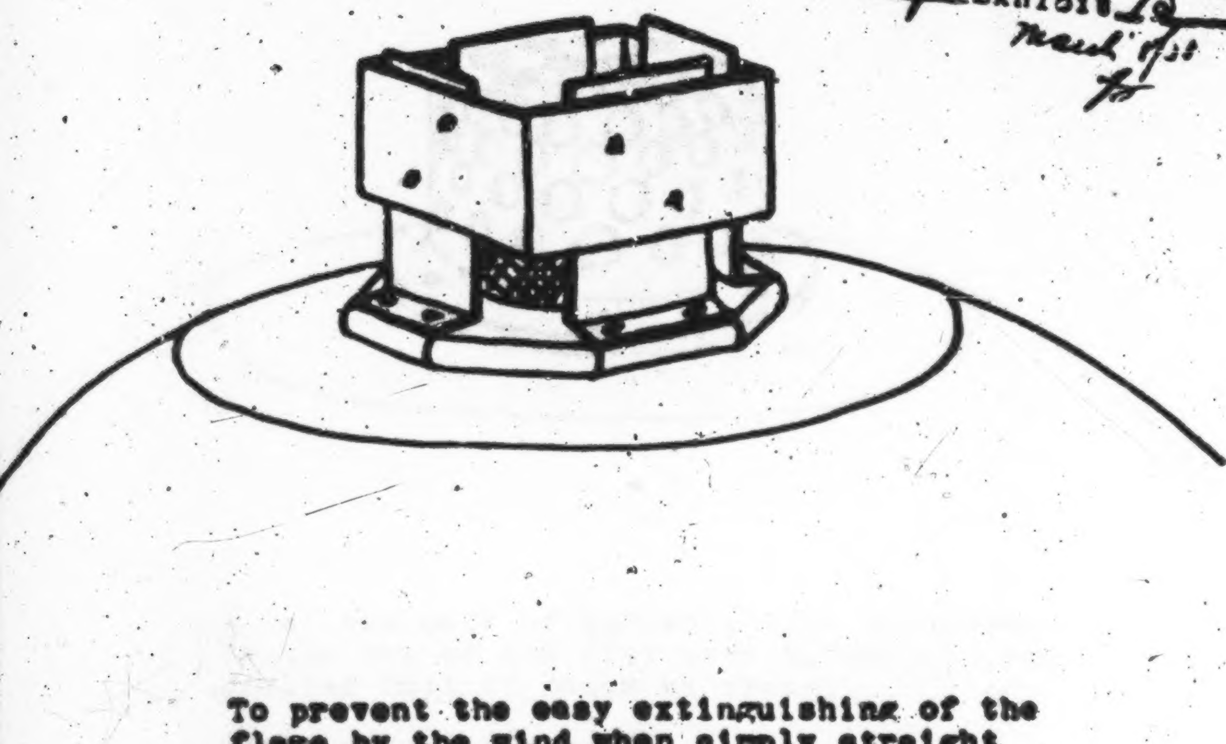
U.S. District[a]
Court E.D.N.Y.
In Equity 8417
Plf Exhibit 15a
March 9/31
B



Sheet metal angles were formed up with one short leg and one long one. The Short leg was spot welded to the top of the flat type burner in such a position to form with the long leg of each angle, a portion of a series of baffles surrounding the wick

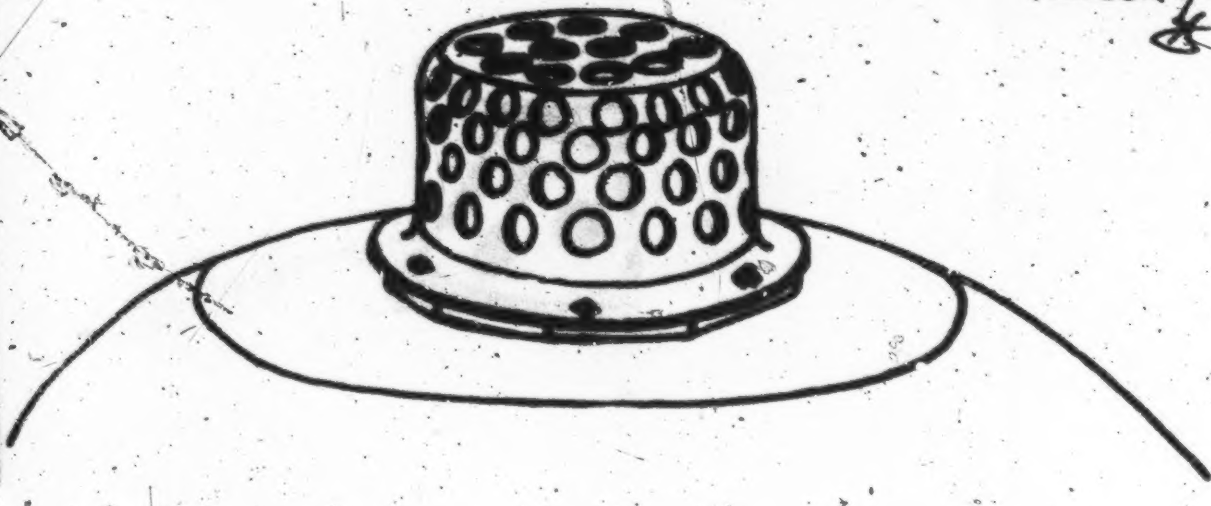
The illustration shows four of these used. Similar tests were made with three, five and six angles arranged in a similar manner to that shown above.

2
U.S. District
Court E.D.N.Y.
In Equity 8417
Df Exhibit 15 B
March 1938



To prevent the easy extinguishing of the flame by the wind when simply straight pieces of metal were placed about the wick, a band around them was tried out. It was an improvement but not practical to make.

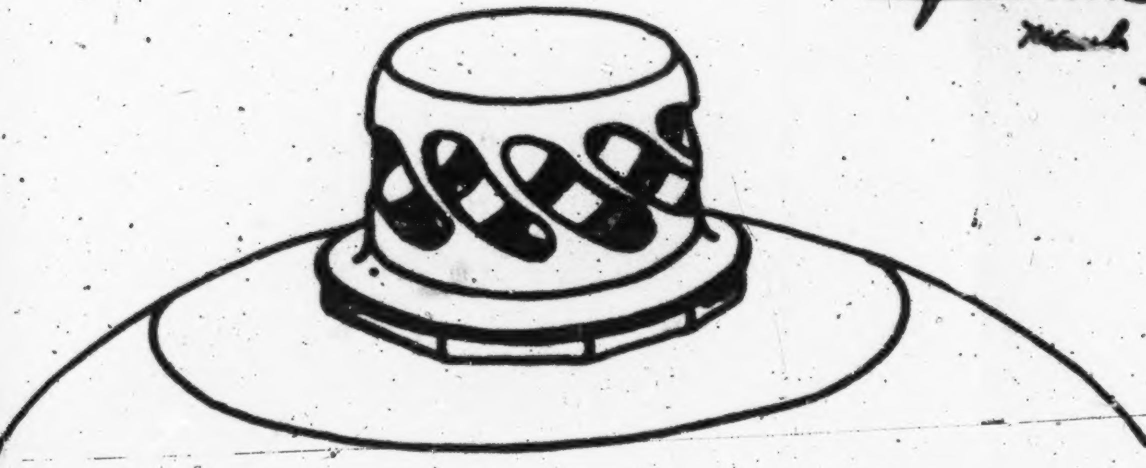
[illegible]ict
Court E.D.N.Y.
In Equity 5417
Pl. Exhibit 15a
March 17 '31



A cap was made of suitable size to fasten to the top of the flat type burner and was drilled full of holes as shown.

Tests proved the merit of enclosing the wick in such a manner but further improvement was necessary to improve ability to withstand rain and wind.

U.S. District
Court E.D.N.Y.
In Equity 8417
Def Exhibit 15 E
March 1/31

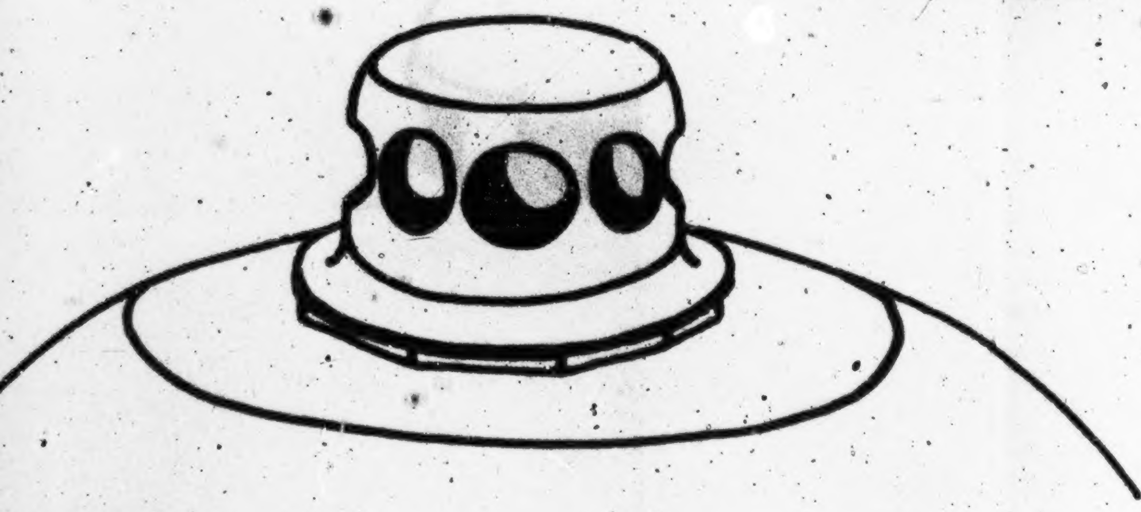


Many caps of shape similar to that shown above were constructed, using different arrangements of perforations and slots in an effort to secure the best results.

5 A
U.S. District
Court E.D.N.Y.
In Equity 4417
Pq Exhibit 15 D
March 8/28
X

A tapered shell with perforations of several different arrangements was covered by a flat disc attached to it to fend off rain.

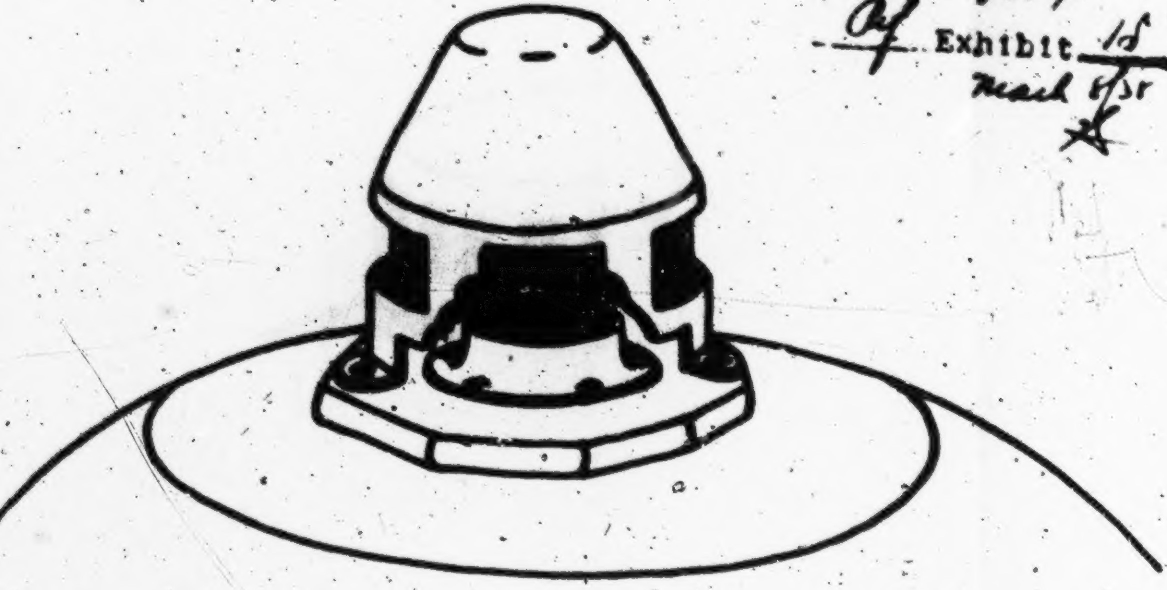
U.S. District
Court E.D.N.Y.
In Equity 4417
Pltf Exhibit 15 F
March 1/38
4



Drilled holes in many different arrangements were experimented with, in addition to sawed and filed slots.

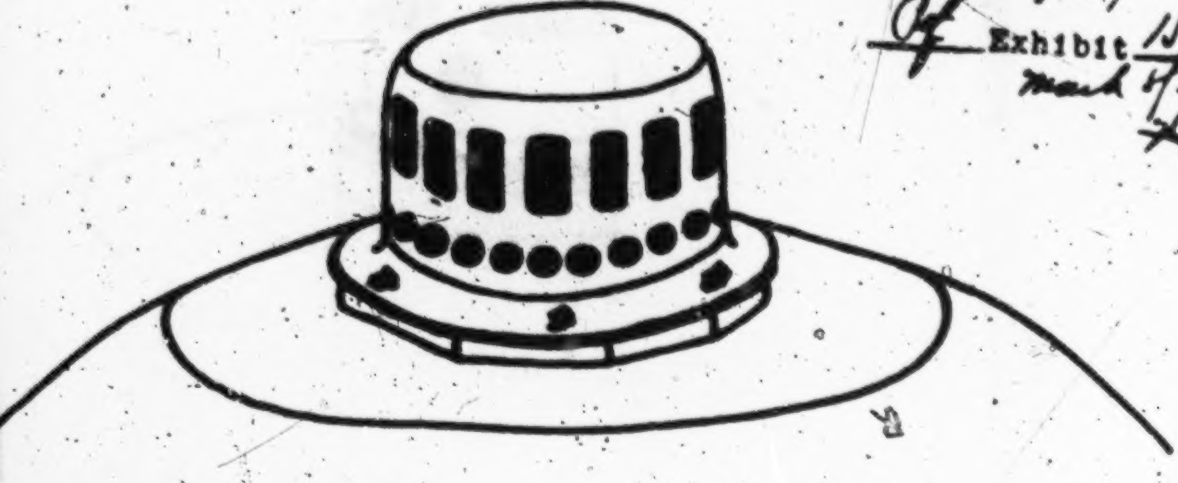
9
10
8

U.S. District
Court E.D.N.Y.
In Equity 8417
Pl. Exhibit 15 G
Mark 6/31



The cutaway section shows the
wick holder collar which was intro-
duced as secondary protection in-
side the shell for the wick.
Previous tests were repeated with
a wick holder of this sort used
in addition to the outer shells.

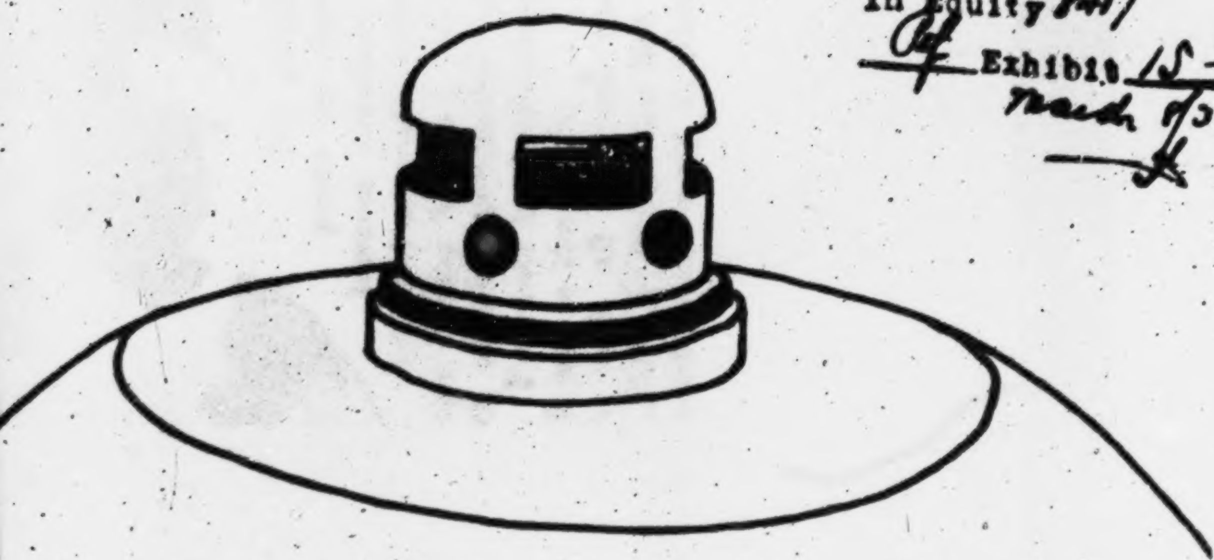
U.S. District
Court E.D.N.Y.
In Equity 9441
Exhibit 15 H
March 1931



The results previously obtained led to a consistent series of experiments with various arrangements of lower holes for the entrance of air and upper holes for the exit of the flame, and the use of a wick holder inside, adjusted at various heights.

1

U.S. District
Court E.D.N.Y.
In Equity 8417
Pff Exhibit 15 1
March 9/38

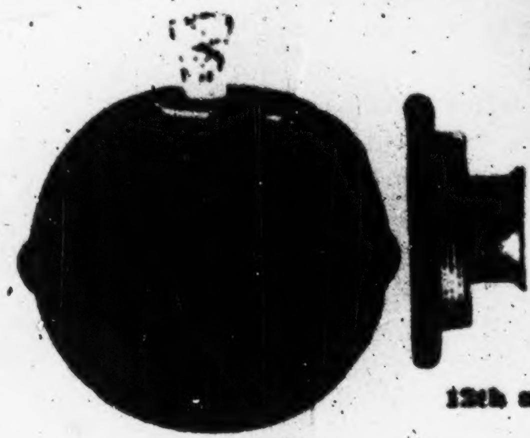


To facilitate better application of wick holder and make possible more consistent results, a screw collar and hood were turned up out of copper in substantially the shape and size shown above. Subsequent hoods turned up out of steel with various arrangements of holes and heights of wick holder resulted in the design and proportions of the present Economy Burner.

A New Feature in an Old Stand-by

TOLEDO TORCHES are now equipped with a NEW BURNER which greatly improves their serviceability.

No Price Changes!
Just more for the money.



No projecting parts to damage. Insures constant flow of fuel at right temperature in any weather. Correct length of wick projection always assured. Prevents back-slippage and loss of wick inside the torch.

Interchangeable with all previous models. Makes THE TOLEDO TORCH the last word in protection of construction work at night.

THE TOLEDO PRESSED STEEL CO.
12th and Woodruff Toledo, Ohio

Greater Protection at Lower Cost

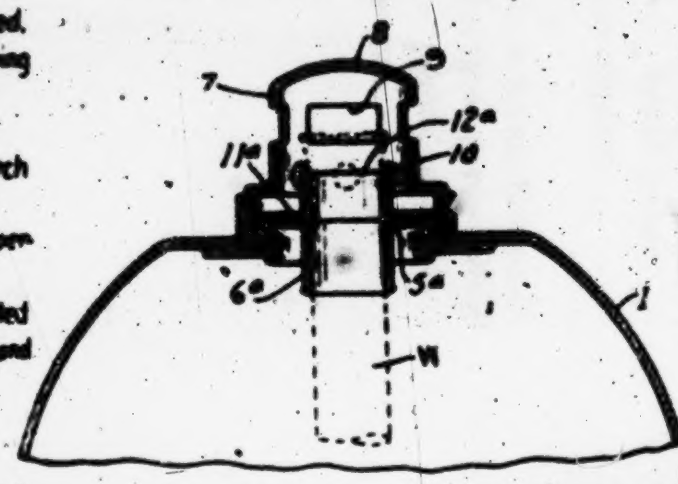
Storm-proof
Theft-proof
Reliable
Safe

To present users of

TOLEDO TORCHES:

Your old torches may be equipped with new burners. Ask your dealer or write us direct.

FIG. 3 OF PATENT IN SUIT



CLAIM 2

2. In a device of the class described,

(A) a torch body (1) having an opening for a wick (W), and

(B) a flame guard for said wick mounted on the outside of said torch body, said guard including

(1) a cap (7) provided with an imperforate top wall (8) and

(2) lateral flame openings (9) adapted to emit a luminescent flame and

(3) air ports (10).

CLAIM 5

5. In a device of the class described

(A) a construction torch having an opening in its upper end for a wick (W),

(B) means (5a, 6a and 12a) to hold the wick in place, and

(C) a guard fitting over the outer end of the wick but spaced from the sides thereof, said guard having

(1) an imperforate top wall (8) and

(2) side flame (openings 9) and

(3) air openings (10).

CLAIM 11

11 A burner for a construction torch adapted to em - a luminescent flame and comprising

(A) a wick holder (5a, 6a and 12a) having

(1, a portion in contact with the wick and

(2) a supporting and heat-receiving flange (5a, 11a) and

(B) means enclosing a space above said flange and surrounding the wick except for provision for lateral exit of flame (9) and restricted entrance of air for combustion (10)

CLAIM 12

12. A burner for a construction torch adapted to emit a luminescent flame and comprising

(A) a wick holder having

(1) a portion (6a, 12a) in contact with the wick and

(2) a lateral flange (5a, 11a) and

(B) a cap (7) enclosing and spaced from the end of the wick and having an imperforate top and

(C) provision for lateral exit of flame (9) and

(D) (provision for) entrance of air (10). and

(E) the bottom of the cap being in heat conducting relation to said flange

Plaintiff's Exhibit 24 877

March 8, 1938

TEST RUN ON ROOF OF OUR BUILDING
FROM 8:25 A. M. TO 5:05 P. M.,
4/12/35

Each torch was filled and adjusted in the manner recommended for practical use under weather conditions.

#1 Using old style open flame burner:
At beginning of period weight . . 9 lbs., 11 oz.
At end of period weight . . . . . . 7 lbs., 10 oz. 878
Oil Consumption . . . . 2 lbs., 1 oz.

#2 Truck Flare using Economy Burner:
At beginning of period weight . . 4 lbs., 3 oz.
At end of period weight . . . . 3 lbs., 1 oz.
Oil Consumption . . . . 1 lb., 2 oz.

TEST RUN ON ROOF OF OUR BUILDING
FROM 8:00 A. M. TO 5:30 P. M.,
4/15/35

Each torch was filled and adjusted in the manner recommended for practical use under weather conditions. 879

#1 Toledo Torch using old style open flame burner:
At beginning of period weight . . 9 lbs., 12 oz.
At end of period weight . . . . 6 lbs., 15 oz.
Oil Consumption . . . . 2 lbs., 13 oz.

#2 Truck Flare using Economy Burners:
At beginning of period weight . . 4 lbs., 2 oz.
At end of period weight . . . . 3 lbs., 0 oz.
Oil Consumption . . . . 1 lb., 2 oz.

Plaintiff's Exhibit 24

880 TEST RUN ON ROOF OF OUR BUILDING FROM 8:45 A. M. TO 6:00 P. M., 4/16/35

Each torch was filled and adjusted in the manner recommended for practical use under weather conditions.

#1 Toledo Torch using old style open flame burner:

At beginning of period weight. .9 lbs., 13 oz.
At end of period weight. . . . . . .6 lbs., 15 oz.
Oil Consumption . . . . .2 lbs., 14 oz.

881

#2 Truck Flare using Economy Burner:

At beginning of period weight. 4 lbs., 4 oz.
At end of period weight. . . . . . .3 lbs., 4 oz.
Oil Consumption . . . . .1 lb., 0 oz.

TEST RUN ON ROOF OF OUR BUILDING FROM 8:30 A. M. TO 5:30 P. M., 4/17/35

Each torch was filled and adjusted in the manner recommended for practical use under weather
882 conditions.

#1 Toledo Torch using old style open flame burner:

At beginning of period weight. .9 lbs., 13 oz.
At end of period weight. . . . . . .6 lbs., 15 oz.
Oil Consumption . . . . .2 lbs., 14 oz.

#2 Truck Flare using Economy Burner:

At beginning of period weight. .4 lbs., 4 oz.
At end of period weight. . . . . . .3 lbs., 2 oz.
Oil Consumption . . . . .1 lb., 2 oz.

Plaintiff's Exhibit 24

TEST RUN ON ROOF OF OUR BUILDING FROM 8:10 A. M. TO 5:30 P. M., 4/18/35 883

Each torch was filled and adjusted in the manner recommended for practical use under weather conditions.

#1 Toledo Torch using old style open flame burner:

At beginning of period weight . . 9 lbs., 13 oz.
At end of period weight . . . . 6 lbs., 14 oz.
Oil Consumption . . . . 2 lbs., 15 oz.

884

#2 Truck Flare using Economy Burner:

At beginning of period weight . . 4 lbs., 3 oz.
At end of period weight . . . . 3 lbs., 0 oz.
Oil Consumption . . . . 1 lb., 3 oz.

TEST RUN ON ROOF OF OUR BUILDING FROM 8:40 A. M. TO 5:20 P. M., 4/19/35

Each torch was filled and adjusted in the manner recommended for practical use under weather conditions. 885

#1 Toledo Torch using old style open flame burner:

At beginning of period weight . . 9 lbs., 13 oz.
At end of period weight . . . . 6 lbs., 9 oz.
Oil Consumption . . . . 3 lbs., 4 oz.

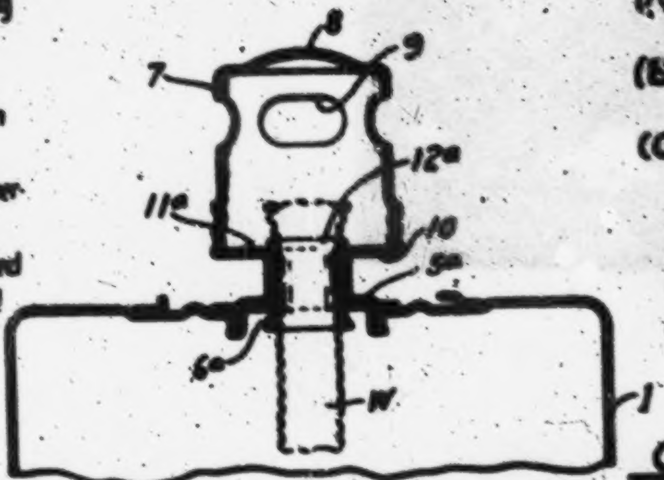
#2 Truck Flare using Economy Burner:

At beginning of period weight . . 4 lbs., 2 oz.
At end of period weight . . . . 2 lbs., 11 oz.
Oil Consumption . . . . 1 lb., 7 oz.

Averages: #1—4.94 oz. per hour.
#2—2.06 oz. per hour.

U.S. District
Court E.D.S.T.,
In Equity No.
P Exhibit 25
March /51
X

DEFENDANT'S FLARE (ANTHES)



CLAIM 2

2 In a device of the class described,
(A) a torch body (1) having an opening for a wick (W), and
(B) a flame guard for said wick mounted on the outside of said torch body, said guard including
(1) a cap (7) provided with an imperforate top wall (8) and
(2) lateral flame openings (9) adapted to emit a luminescent flame, and
(3) air ports (10).

CLAIM 5

5. In a device of the class described,
(A) a construction torch having an opening in its upper end for a wick (W),
(B) means (5a, 6a and 12a) to hold the wick in place, and
(C) a guard fitting over the outer end of the wick but spaced from the sides thereof, said guard having
(1) an imperforate top wall (8) and
(2) side flame (openings 9) and
(3) air openings (10).

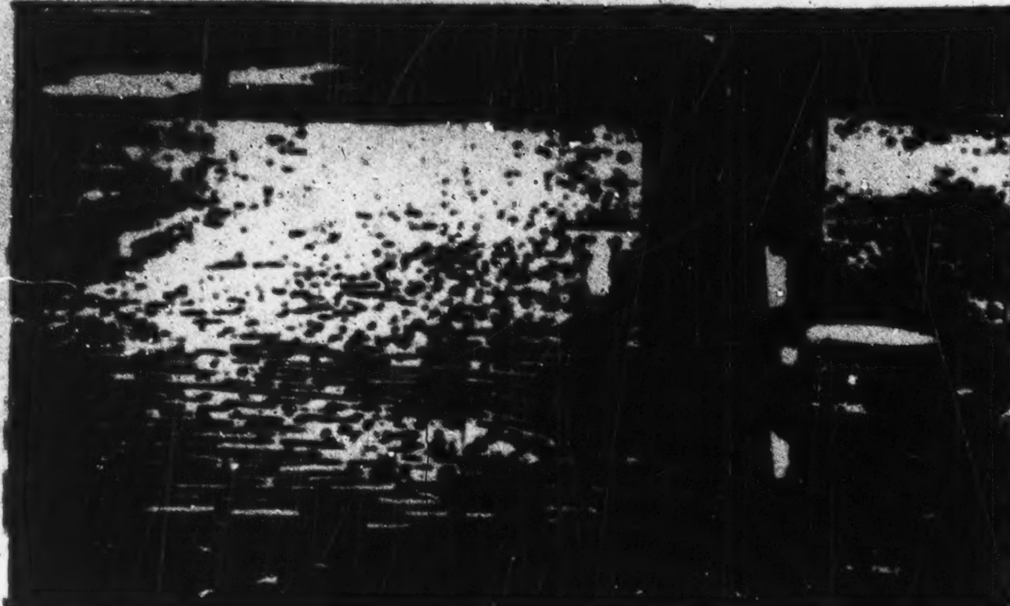
CLAIM 11

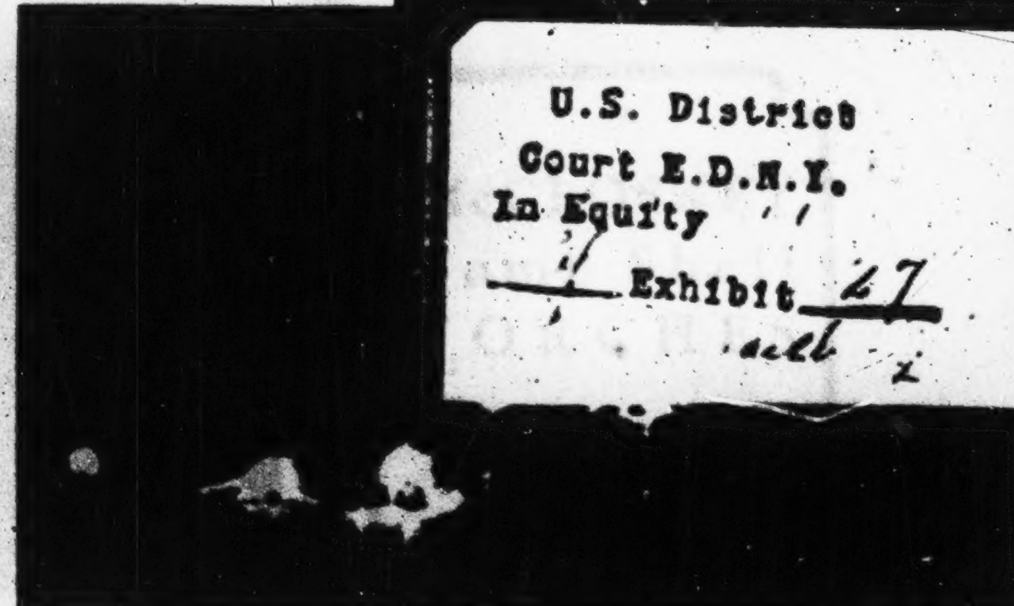
11 A burner for a construction torch adapted to emit a luminescent flame and comprising
(A) a wick holder (5a, 6a and 12a) having
(1) a portion in contact with the wick and
(2) a supporting and heat-receiving flange (5a, 11a), and
(B) means enclosing a space above said flange and surrounding the wick except for provision for lateral exit of flame (9) and restricted entrance of air for combustion (10).

CLAIM 12

12. A burner for a construction torch adapted to emit a luminescent flame and comprising
(A) a wick holder having
(1) a portion (6a, 12a) in contact with the wick and
(2) a lateral flange (5a, 11a), and
(B) a cap (7) enclosing and spaced from the end of the wick and having an imperforate top and
(C) provision for lateral exit of flame (9) and
(D) (provision for) entrance of air (10), and
(E) the bottom of the cap being in heat conducting relation to said flange.

McCloskey Bomb Shell Torch as a Sentinel and in Use by Street Railways





U.S. District
Court E.D.N.Y.
In Equity
Exhibit 27

McCloskey Torch No 1
4 quart capacity will burn 48 hours.

$35.00
per doz.
f. o. b. Toledo

McCloskey Torches are used exclusively by city public works, county and state highway commissioners, electric and steam railroads, the United States Department of Agriculture and many of them are shipped abroad.

Users of McCloskey Torches have reduced accident claims nearly 100 per cent. McCloskey Torches remain lighted during the hardest wind and rain storms—they stay on the job where other warning signals fail. Easily carried by special handle.

McCloskey Torch No. 2
3 quart capacity will burn 36 hours.

$24.00
per doz.
f. o. b. Toledo

How the Toledo City Water Department uses McCloskey Bomb Shell Torches

How the Toledo City Water Department uses McCloskey Bomb Shell Tor[illegible]s. *McCLOSKEY* Torches are made in two halves, of rolled and pickled deep drawn steel and welded together. Sufficient cast iron counter balance pressed in the bottom absolutely prevents them from being knocked over.

McCLOSKEY Torches will burn from Saturday night until Monday [illegible]orning, with just one filling. No barricading is necessary.

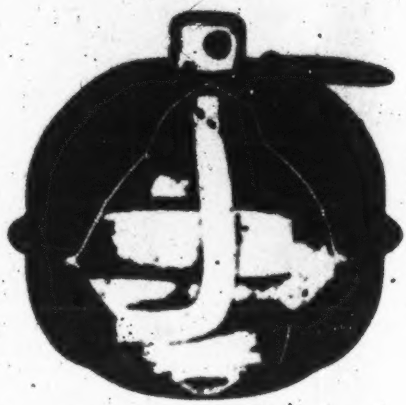
McCLOSKEY Torches are never stolen—they are suitable for construction work only.

McCLOSKEY Bomb Shell Torches are equipped with wick and are ready for instant use. Note exclusive design, sturdiness and adaptability.

McCLOSKEY
BOMB SHELL TORCH

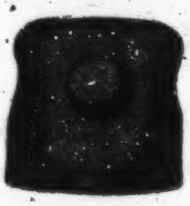
"*The Best Danger Signal*"

- UNBREAKABLE
- ECONOMICAL
- RELIABLE
- LEAK-PROOF
- EFFICIENT
- CYCLONE BURNER

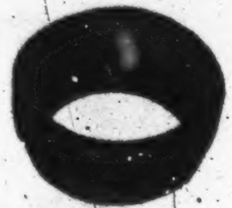


Specified by State Officials
The U. S. Department of Agriculture

McCLOSKEY TORCH CO.
1215 West Bancroft Street
TOLEDO, OHIO, U. S. A.



Corhane Burner



Adapter for Earlier Models

Wick Holder

Torches now being used without Corhane Burners may be easily equipped with this wonderful improvement by means of our adapter and wick holder shown above.

Price List

(Standard Package Lots)

No. 1	Large	4 quart capacity, 13 Gauge Steel	$35.00 per dozen
No. 2	Small	3 quart capacity, 15 Gauge Steel	24.00 per dozen
No. 3	Flat Bottom	1½ quart capacity, 13 Gauge Steel	18.00 per dozen
Kit—	Container and three No. 3 torches		6.20 per kit
Container only			1.70 each
Cotton Wicks			1.75 per dozen
Corhane Burner Caps			2.40 per dozen
Wick Holders			1.20 per dozen
Adapters			2.40 per dozen

Prices are subject to change without notice

Standard Packages

No. 1	Three in carton	Shipping weight	20 pounds
No. 2	Six in carton	Shipping weight	[illegible] pounds
No. 3	Twelve in carton	Shipping weight	[illegible] pounds
Kit	One in carton	Shipping weight	12 pounds
Container only	One in carton	Shipping weight	6 pounds

Terms: F. O. B. Toledo, Ohio. 2% 10 days, net 30 days.

McCloskey Torch Co.

1215 W. Bancroft Street TOLEDO, OHIO, U. S. A.

Printed in U.S.A.

Plaintiff's Exhibit 29 919
March 8, 1938

FUEL CONSUMPTION TEST

Object:

To determine the relative fuel consumption of four torches under a series of normal operating conditions.

Apparatus:

One regular Toledo Truck Flare, No. 770.

One Anthes Truck Flare purchased from Montgomery, Ward & Company at Lima, Ohio. 920

One old style open flame Toledo Torch.

One triple wick cast iron torch obtained from Detroit Street Railway Dept.

Procedure:

All torches were properly filled with kerosene, sp. gr. .7995 at 60°, flash point 135°. The wick on the Toledo Flare was set at approximately 1/8″ extension as prescribed in the instruction sheet packed with each Toledo Flare. The wick on the Anthes Flare was set at approximately 1/8″ extension. The wick on the old style torch was set at 1½″ extension. The wick on the Detroit Torch 921
was set at 1/4″ extension.

Each torch was weighed on a Hanson Spring Balance and the gross weight recorded.

All torches were lighted and placed on top of the observation stand installed on the roof of the factory of The Toledo Pressed Steel Company, where they could be observed continuously from the office. The starting time was noted and recorded. At the end of the period, the torches were extinguished and reweighed. The weights were recorded, the difference between the starting

922 weight and finishing weight being the weight of fuel consumed during that period.

This procedure was followed on several consecutive days to get an average of all conditions.

Conditions:

A variety of weather conditions was encountered during the period of this test, but for the most part the conditions were just a good average of the conditions met with in usual service. Temperature ranged from freezing to several degrees above. A moderate breeze was present practically all of the time keeping all flames quite active. There were

923 occasional light flurries of fine rain. The test was conducted throughout with the wick extensions noted above.

Results:

Feb. 1st, 1938 10:25 A. M.-2:25 P. M.
(Total elapsed time 4 Hrs.)

Torch	Start Wt.	Finish Wt.	Loss	Rate Per Hr.
Toledo E. B.	4 lb.	3 lb. 9 oz.	7 oz.	1.75 oz.
Anthes	2 " 10 oz.	2 " 6 "	4 "	1.00 "
Toledo O. S.	10 " 8 "	9 " 1 "	1 lb. 7 "	5.75 "
Detroit	21 " 9 "	20 " 6 "	1 " 3 "	4.75 "

924

Feb. 2nd, 1938 8:25 A. M.-3:25 P. M.
(Total elapsed time 7 Hrs.)

Toledo E. B.	4 lb. 4 oz.	3 lb. 11 oz.	9 oz.	1.28 oz.
Anthes	2 " 6 "	1 " 11 "	11 "	1.57 "
Toledo O. S.	9 " 1 "	7 " 6 "	1 lb. 11 "	3.86 "
Detroit	21 " 7 "	19 " 13 "	1 " 10 "	3.72 "

Feb. 4th, 1938 8:30 A. M.-5:00 P. M.
(Total elapsed time 8.5 Hrs.)

Toledo E. B.	4 lb.	3 lb. 3 oz.	13 oz.	1.53 oz.
Anthes	2 " 9 "	1 " 12 "	13 "	1.53 "

Plaintiff's Exhibit 29

Toledo O. S.	10 " 3 "	7 " 13 "	2 lb. 6 "	4.70 "	925
Detroit	21 " 6 "	19 " 3 "	2 " 3 "	4.12 "	

Feb. 5th, 1938. 8:15 A. M.-3:15 P. M.
(Total elapsed time 7 Hrs.)

Toledo E. B.	3 lb. 11 oz.	2 lb. 15 oz.	12 oz.	1.72 oz.
Anthes	2 " 10 "	1 " 12 "	14 "	2.00 "
Toledo O. S.	10 " 1 "	8 " 6 "	1 lb. 11 "	3.86 "
Detroit	21 " 5 "	19 " 12 "	1 " 9 "	3.58 "

Feb. 7th, 1938 8::55 A. M.-4:50 P. M.
(Total elapsed time 7.92 Hrs.)

Toledo E. B.	4 lb. 3 oz.	3 lb. 8 oz.	11 oz.	1.39 oz.	926
Anthes	2 " 10 "	1 " 12 "	14 "	1.76 "	
Toledo O. S.	10 " 6 "	7 " 12 "	2 lb. 10 "	5.17 "	
Detroit	21 " 9 "	19 " 6 "	2 " 3 "	4.41 "	

Feb. 8th, 1938 9:30 A. M.-4:15 P. M.
(Total elapsed time 6.75 Hrs.)

Toledo E. B.	4 lb. 3 oz.	3 lb. 4 oz.	15 oz.	2.22 oz.
Anthes	2 " 9 "	1 " 11 "	14 "	2.07 "
Toledo O. S.	10 " 3 "	8 " 6 "	1 lb. 13 "	4.30 "
Detroit	21 " 7 "	19 " 9 "	1 " 14 "	4.44 "

Feb. 9th, 1938 9:55 A. M.-4:35 P. M. 927
(Total elapsed time 6.67 Hrs.)

Toledo E. B.	4 lb.	3 lb. 5 oz.	11 oz.	1.64 oz.
Anthes	2 " 9 oz.	1 " 15 "	10 "	1.50 "
Toledo O. S.	10 " 7 "	8 " 9 "	1 lb. 14 "	4.5 "
Detroit	21 " 8 "	19 " 9 "	1 " 15 "	4.65 "

Average fuel comsumption:

	Rate in Oz. per Hour
Toledo E. B.	1.637
Anthes	1.633
Toledo O. S.	4.634
Detroit	4.238

928 **Plaintiff's Exhibit 30**

March 8, 1938

WIND VELOCITY TEST

Object:

To determine relative ability of four torches to withstand wind velocities of varying intensities.

Apparatus:

Wind tunnel constructed by The Toledo Pressed Steel Company after design suggested by the DeVilbiss Co., who supplied the Fan. (See photos herewith.) Various wind velocities are obtained
929 by the use of cardboard reduction plates having openings of 12½"x15½" diameter. These are applied to the intake end of the tunnel to restrict the flow of air and result in speeds which have been calibrated with a Tycos Van Type Anemometer as being 25.1 and 26.9 m.p.h., respectively, and the full opening wind velocity as 28.7 m.p.h. at a central point one foot from the discharge end of the tunnel.

One Anthes Truck Flare purchased from Montgomery, Ward & Co. at Lima, Ohio, and used as purchased.

930 One Toledo No. 5 Truck Flare.

One old style open flame Toledo Torch of spherical shape and three-quart capacity.

One old style triple wick burner, cast iron torch furnished by Mr. Kerwin, Supt. Ways & Structures, Detroit Street Railways Company. This torch was used just as furnished.

Procedure:

All torches were filled to normal level with straight kerosene of flash point 135°, sp. gr. .7995 at 60° Fah. The wicks in each the Toledo Truck Flare and the Anthes Truck Flare were set at ⅛"

Plaintiff's Exhibit 30

wick extension. This is according to directions for 931
Toledo Flares. No directions were supplied with the Anthes flare. The Wicks in the cast iron Detroit torch were set at 3/8" and in the old style Toledo Torch at 1½" extension. All torches were lighted and allowed to warm up.

The reduction plate with the smallest opening, 12½", was used first. Each torch was placed in position and the length of time it remained lighted for a period less than 15 minutes, was noted and recorded. If it remained lighted for 15 minutes, it was considered that it was stable in this wind
velocity. This was repeated using the reduction 932
plate of 15½" opening and also without any reduction plates.

It was found that at any wind velocity, interception of the hand or hands between the flame and the wind source would extinguish the flame in the case of each of the open flame torches, but no arrangement of the hands would extinguish the flame on the Anthes or Toledo Truck Flares using the hood.

Conditions:

The test was conducted in the hallway com-
pressor room in the factory of The Toledo Pressed 933
Steel Company, 397 Phillips Ave., Toledo, Ohio, beginning at 9:40 A. M. on Thursday, Jan. 27th, 1938. The test was conducted by Mr. Close and observed by Mr. Withrow.

Results:

Time Remained Lighted

Torch	25.1 mph.	26.9 mph.	28.7 mph.
Anthes	15 minutes	15 minutes	15 minutes
Toledo E B	15 "	15 "	15 "
Toledo O S	15 "	15 seconds	2 minutes, 30 seconds
Detroit	5 "	2 minutes	50 seconds

934 *Conclusion*:

This experiment demonstrates that the stability of an open flame is an uncertain quantity, even though the wick is adjusted to meet severe conditions. It further demonstrates that with an increase in wind velocities, this uncertainty increases. It also demonstrates the stability of a flame controlled by design of the burner on these hooded torches.

935

936

Plaintiff's Exhibit 32 937
March 9, 1938

IOWA
STATE HIGHWAY COMMISSION
AMES, IOWA

April 9, 1935.

The Toledo Pressed Steel Co.,
397 Phillips Avenue,
Toledo, Ohio.

ATTENTION MR. LYMAN W. CLOSE

Gentlemen:

In response to your recent request for informa- 938
tion regarding our truck flare laws, their administration and the methods of tests for the flares used under the requirements of these laws, rules, regulations and the specifications developed for the flares, we have prepared the following statement:

Certain of the laws enacted by the Forty-Fifth General Assembly of Iowa Legislature, early in the spring of 1933, required that after May 4, 1933, motor trucks and motor truck combinations, during the period from one-half hour after sunset to one-half hour before sunrise, should be equipped at all
times with portable flares. These flares were to be 939
used in indicating the location of the vehicle when stopped on or adjacent to the travelled roadway during the hours of darkness.

The laws as stated in Chapter 83 of the Acts of the Forty-Fifth General Assembly failed to specify the enforcing agency, but it has been held that the Motor Vehicle Department was implied as this agency. ~~Under this ruling it was further im-~~plied that the Motor Vehicle Department had authority to prepare rules and regulations for the enforcement of, and compliance with these laws.

940 The rules and regulations issued by the Motor Vehicle Department have been published in a pamphlet of Motor Vehicle Laws prepared and circulated by that department. Two copies of this pamphlet have been enclosed. The flare laws are found on pages 21 and 22, and the rules and regulations arising from them on page 22.

In these rules and regulations the Iowa State Highway Commission became involved in the administration of the laws through a co-operative agreement with the Motor Vehicle Department to the extent whereby the Highway Commission
941 would test the flares and make recommendations regarding their disposition and use.

The first action of the Highway Commission was that of a survey of the types of flares which would be available for this use, and the second consideration was that of a specification and method of test for the selection of the flares which would be satisfactory. As a result, after a considerable amount of experimental work, specifications for flares were developed by the Highway Commission and approved by the Motor Vehicle Department. These studies were made upon all the readily available
942 types of flares and signal lamps which could be considered practical for tho use to which they were to be put.

In the experimental work it first became necessary to select the characteristics of the flares to be observed and measured, and, second, to devise methods of tests for the accomplishment of these objectives. Four tests were devised, namely the wind test, the combined wind and rain test, the carbon deposition test, and the length of burning timc test.

For the wind tests a wind tunnel was prepared

in which definite velocities of wind could be pro- 943
vided, and these velocities repeated as often as desired. After a somewhat lengthy consideration of actual operating conditions as they would exist for these flares when used in Iowa, two velocities were selected for these tests, one of 40 miles per hour, and the other of 26 miles per hour.

In the combined rain and wind test, the wind velocity was 26 miles per hour, and the rain applied at the rate of 2.48 inches per hour. In the carbon deposition test, the amount of carbon and its effect on the behavior of the flare was noted after two
hours of operation in a quiet atmosphere. The 944
length of burning time was determined by actual tests of the flares or lamps under actual operating conditions.

The specifications for the flares which were adjudged to be satisfactory required, for the wind tests, that the flare remain lighted at least 30 seconds in the wind at 40 miles per hour, and that it should burn continuously in the wind at 26 miles per hour; that the flare burn for at least five minutes in the combined rain and wind test; for the carbon deposition test, that the carbon deposit be
light and the flare burn, or remain in such con- 945
dition that it would pass the two preceding tests; for the burning time tests, that the flare or lamp remain lighted for at least eight hours.

In the experimental work preceding the development of these tests and the preparation of the specifications, it was found that a considerable number of flares could be made available for use as satisfactory signals under the requirements of the truck flare law. The principal group of these flares were of the oil burning, wick equipped class. These were of two general types, the open or un-

946 protected flame type and the hooded, or protected, flame type. None of the open flame type gave satisfactory performances in the tests described above, particularly the wind and the combined wind and rain tests.

The hooded or protected flame type proved to be a great improvement over the open flame type. There were offered, however, samples of the hooded type which failed to meet the requirements of the above specifications, principally for the reason that the combustion chamber within the hood protecting the flame was either insufficiently

947 ventilated, or was too small to permit satisfactory combustion of the oil and gases down from the wick.

As a result none of the open flame type were considered satisfactory for use in this work, and the results of these tests were checked by observations of the performance of the open flame type, which have been used in some form or another as flares indicating obstructions, work under construction, or barricades on construction projects.

All of the hooded or protected flame type were found to be a great improvement over the open

948 flame type as produced by the same manufacturer. In several instances manufacturers originally producing open flame types of flares improved them by enclosing, hooding, or in some manner protecting the flame. In some cases, however, manufacturers not previously producing flares presented samples of hooded types of flares which were unsatisfactory. In the majority of cases the flares were made satisfactory by re-designing or improving the construction of the hood, cap, or other protection for the flame.

Plaintiff's Exhibit 32

We believe this will giye you, briefly, the history 949
of the development of flares, flare tests, and flare specifications, as they have been accomplished in Iowa.

We regret that we were unable to comply with your request soner, but illness and other pressing duties have delayed action on our part.

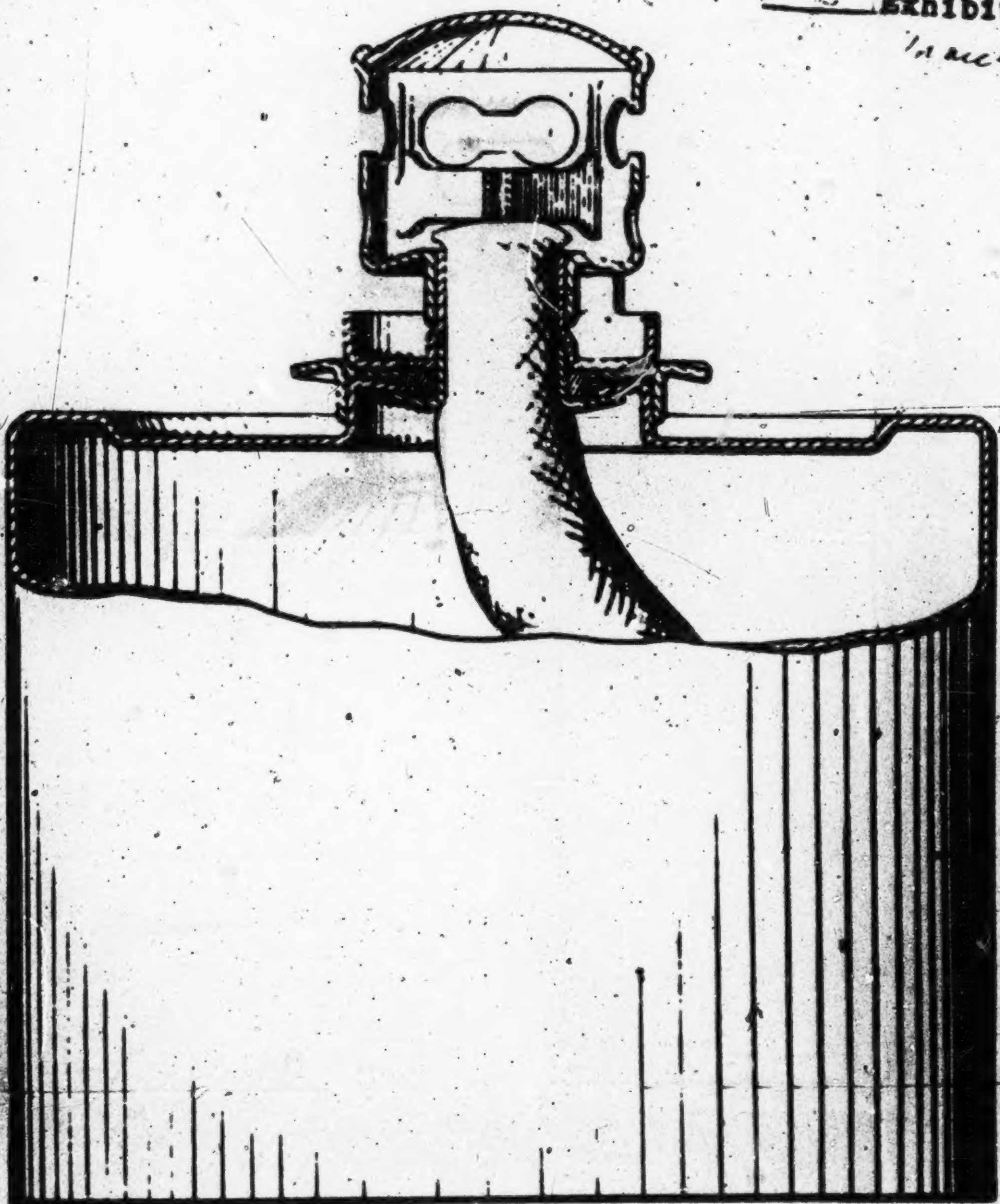
Yours very truly,
(Signed) Mark Morris,
Research Assistant

MM:BY
Enclosures

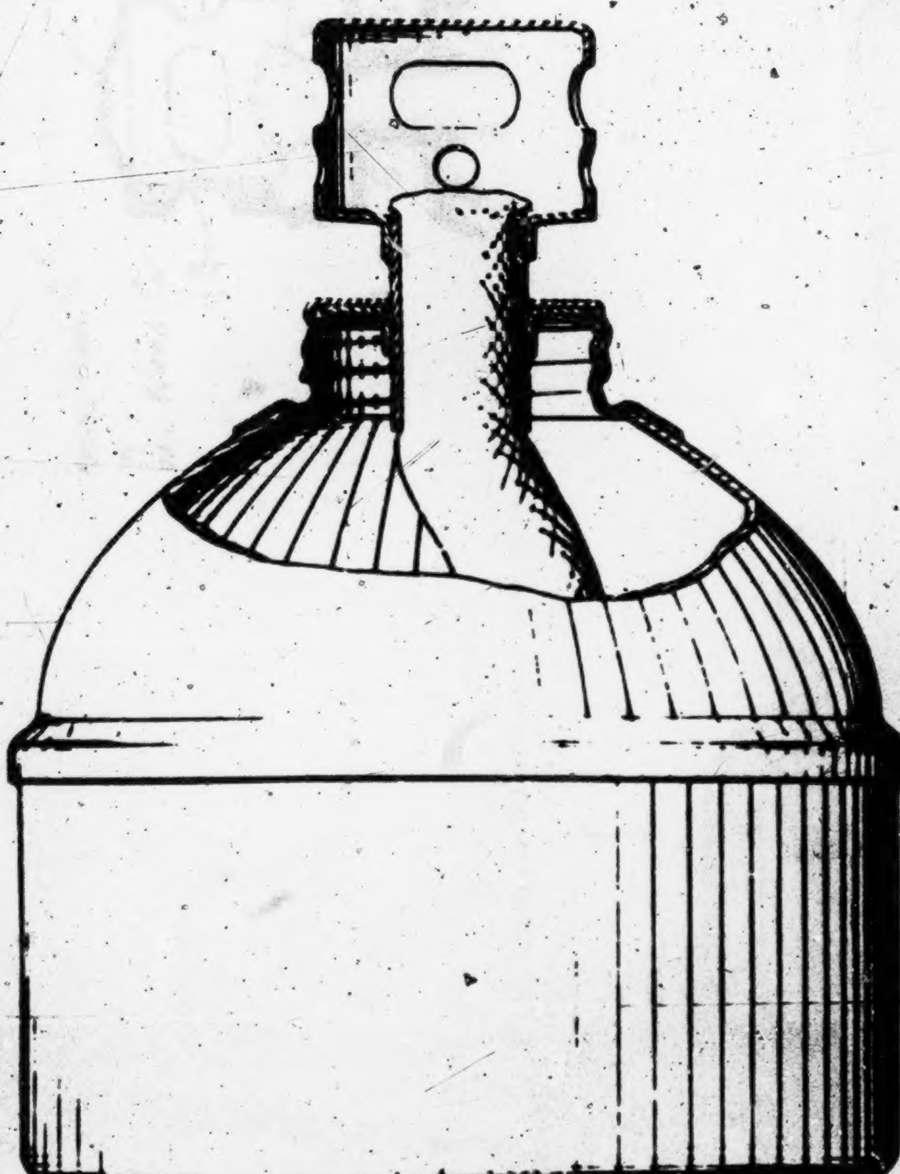
950

951

U.S. District
Court E.D.N.Y.
In Equity 8411
42 Exhibit 33
March-4-35
Ks



U.S. District
Court E.D.N.Y.,
In Equity 34
Exhibit 34



District Court E.D.N.Y.
In Equity 141
Exhibit 12

Toledo Pressed Steel Co
vs
Montgomery Ward Co
No E 8417
Deft's Ex. 5

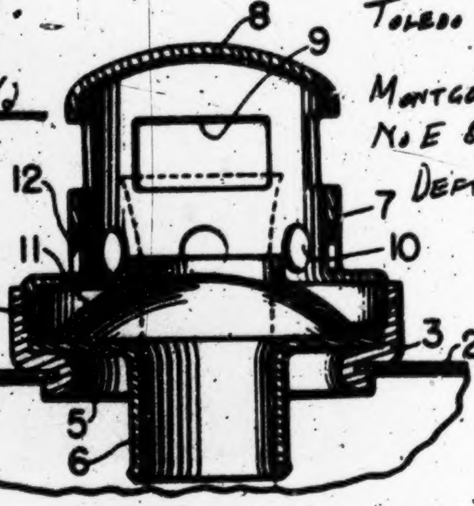


FIG. 1
WITHROW

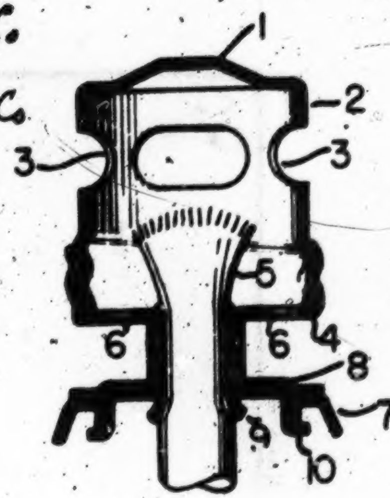


FIG. 2
ANTHES

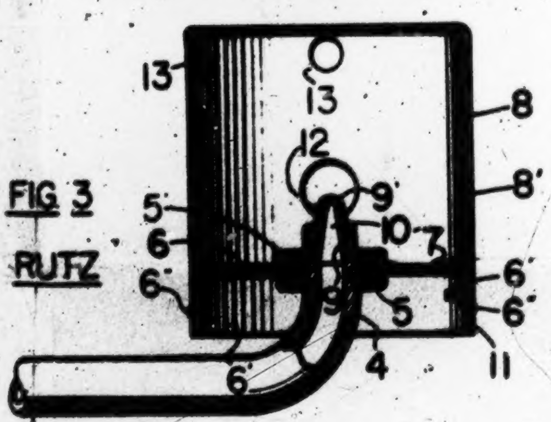


FIG. 3
RUTZ

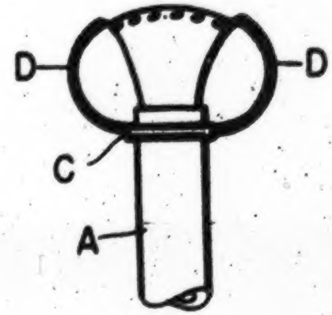
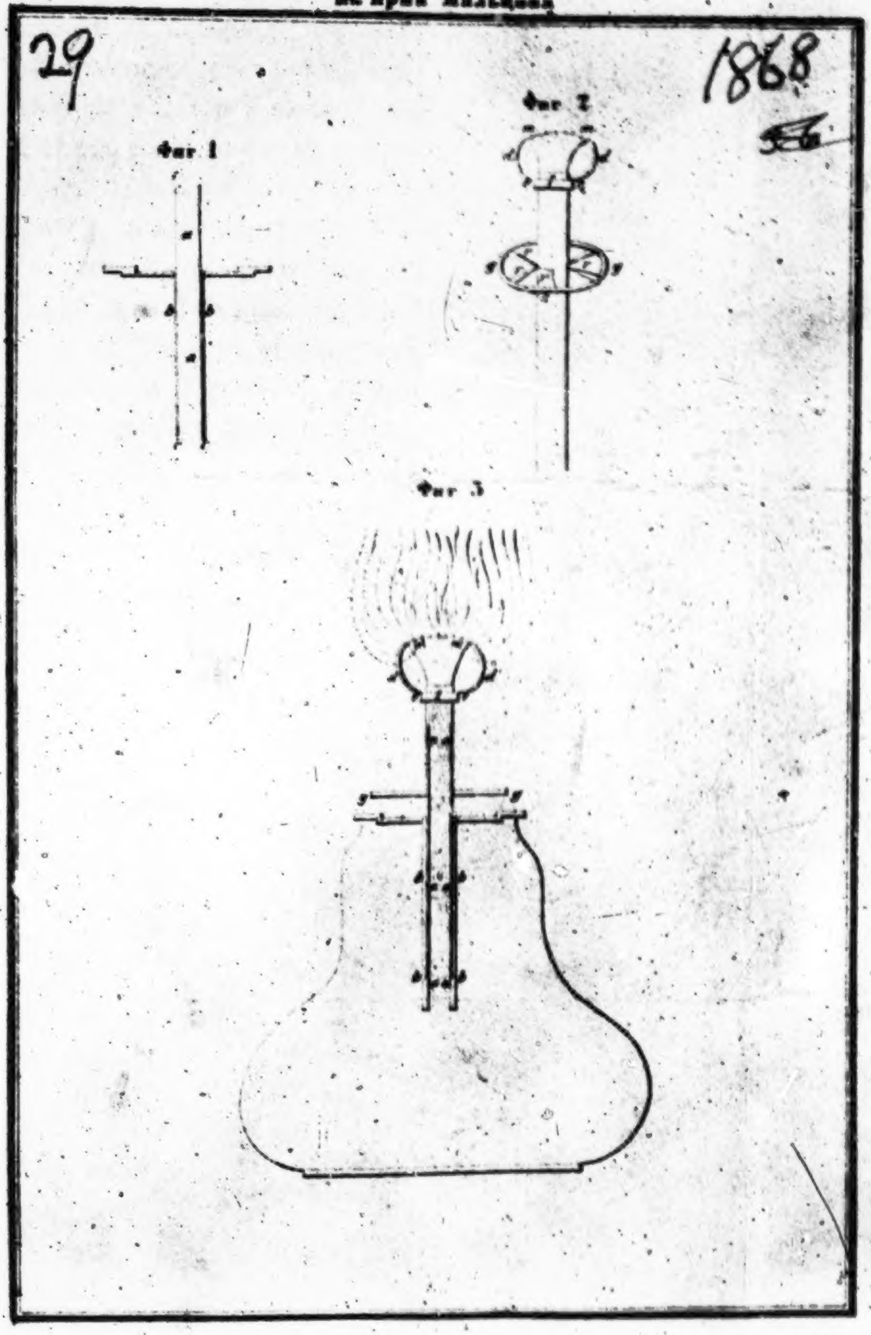


FIG. 4
MALCOV

1163

Къ прив Мальцова



Defendant's Exhibit C 979

Translation from Russian

Malcov Patent

1163. 29-1868

Drawing to Patent Granted to Malcov.

29) To Major General Malcov, Patent on a Lamp Burner of Special Construction, Issued on July 9, 1868, for the duration of five years, on Application of Citizen Veselov of August 8, 1867.

Explanation of the submitted specification: in the drawing Figure 1 is the burner, in which the tube *a* is not fixed to the disc directly but by means of another tube *b* soldered at *c* to the lower end of 980 the tube *a*. In this manner bewteen the tubes *a* and *b* there remains a space into which may enter a third tube called regulator and intended for the adjusting of the size of the flame. Into the tube *a*, as shown in Figure 3, is introduced the wick made of capillary material and capable of conducting rapidly both the liquid as well as its vapors from the reservoir of the lamp. In order to protect the top portion of the wick from deterioration, the upper portion of the burner directly above the wick is packed with asbestos, crushed charcoal or some other incombustible material readily conducting 981 liquid; in this connection care is to be taken that no more than 1/4" of free space is left to the upper exterior end of the burner. Figure 2 shows the regulator, which is longer than the tube shown in Figure 1; in the upper portion of the regulator soldered (cemented) with red copper are provided perforations designated in the drawing by dots. The upper portion of the regulator on both sides is traversed by the two arcs *d*, *d*, connected with the ring *c*, but not constituting an essential part of the burner. These arcs are arranged for the purpose

982 of heating the regulator and transforming the liquid into gas. The ring *g* with radii *r* soldered to the tube of the regulator serves for the raising and lowering of the regulator, depending on the requirements. In Figure 3 is shown the lamp with the regulator, the tube of which regulator is introduced between the tubes *aa* and *bb* of the burner for the purpose of preventing the gas, which is fairly heavy, from passing downward, as otherwise not all of the gas would pass through the openings provided in the upper portion and would not combust completely, but would volatile
983 without usefulness. The lamp of the described construction is extinguished by raising of the burner.

The present invention has been examined in the Councils of Manufacture and the Ministry of Finance.

984

Fig. 4.

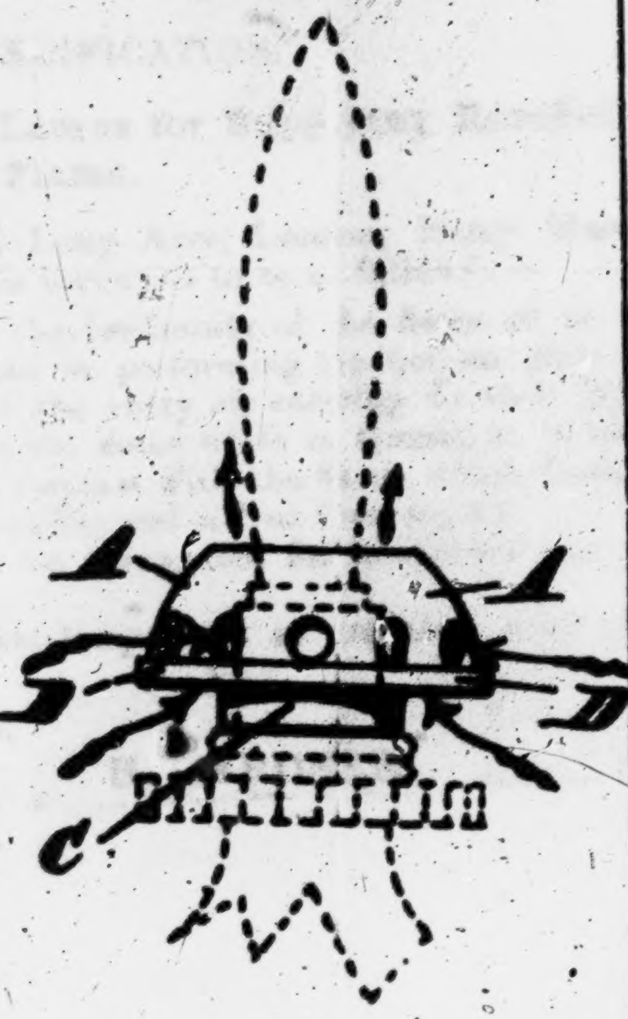
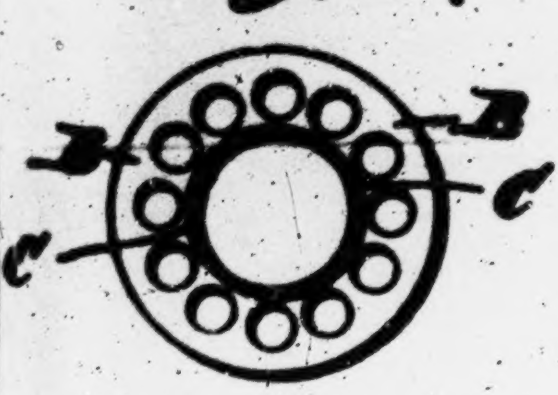


Fig. 1.

Fig. 2.

Fig. 3.



This Drawing is a full size reproduction of the Original

N° 16,524 A.D. 1895

Date of Application, 3rd Sept., 1895

Complete Specification Left, 3rd June, 1896—Accepted, 4th July, 1896

PROVISIONAL SPECIFICATION.

An Improvement in Domes of Oil Lamps for Supplying Rarefied Air to the Flame.

I, Henry Salsbury, of 125 and 126 Long Acre, London, Lamp Manufacturer, do hereby declare the nature of this invention to be as follows:—

This invention has for object, improving the luminosity of the flame of an oil lamp by making the dome of such shape and in perforating the bottom plate as well as the upper surface near the rim, that the entry air entering by such holes takes up heat from the wick tube and from the dome while in transit, as to issue from an annular or other recess into direct contact with the flame, which flame is not only enriched thereby but burns more steadily and is free from smoke.

The neck of the dome may be split or be corrugated for increasing the air passages.

The invention is chiefly intended for socket lamps such as are used with road vehicles.

Dated this 3rd day of September 1895.

H. GARDNER,
Patent Agent, 166 Fleet Street, London,
Agent for the said Henry Salsbury.

COMPLETE SPECIFICATION.

An Improvement in Domes of Oil Lamps for Supplying Rarefied Air to the Flame.

I, Henry Salsbury, of 125 and 126 Long Acre, London, Lamp Manufacturer, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This invention has for object, improving the luminosity of the flame of an oil lamp by making the dome of such shape and in perforating the bottom plate as well as the upper surface near the rim that the entry air entering by such holes takes up heat from the wick tube and from the dome while in transit as to issue from an annular or other recess into direct contact with the flame, which flame is not only enriched thereby but burns more steadily and is free from smoke. The neck of the dome may be split or be corrugated for increasing the air passages.

The invention is chiefly intended for socket lamps such as are used with road vehicles.

My invention is clearly represented in the annexed drawings.

Figure 1 side elevation of dome.

Figure 2 section.

Figure 3 plan of base.

Figure 4 side elevation of position occupied by dome on my previously Patented Anti Candle Lamp No. 22196 of the year 1892 to which it is specially but not exclusively applicable.

Salsbury's Impt. in Domes of Oil Lamps for Supplying Rarefied Air to the Flame.

A, cap. B, base. C, neck, which is preferably in two pieces and look in opposite directions, the two being clamped as one by the rim D of the cap or dome A. The neck may be part of the wick tube or as sleeve outside a wick tube both disc and dome being perforated or otherwise formed with air passages to feed the flame and increase its luminosity by the concentration and inward deflection, the heat generated by contact in passing through the dome rendering such air rarefied and more suitable for combustion and producing increase of light, said air issuing from an annular or other aperture into direct contact with the flame.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed I declare that what I claim is:—

1. The improvement in domes for oil lamps, as described for the purpose set forth.
2. Constructing domes for oil lamps of two perforated discs with necks inverted and clamped within the rim near which are other perforations as shown on the annexed drawings for the purpose described.

The 3rd day of June 1896.

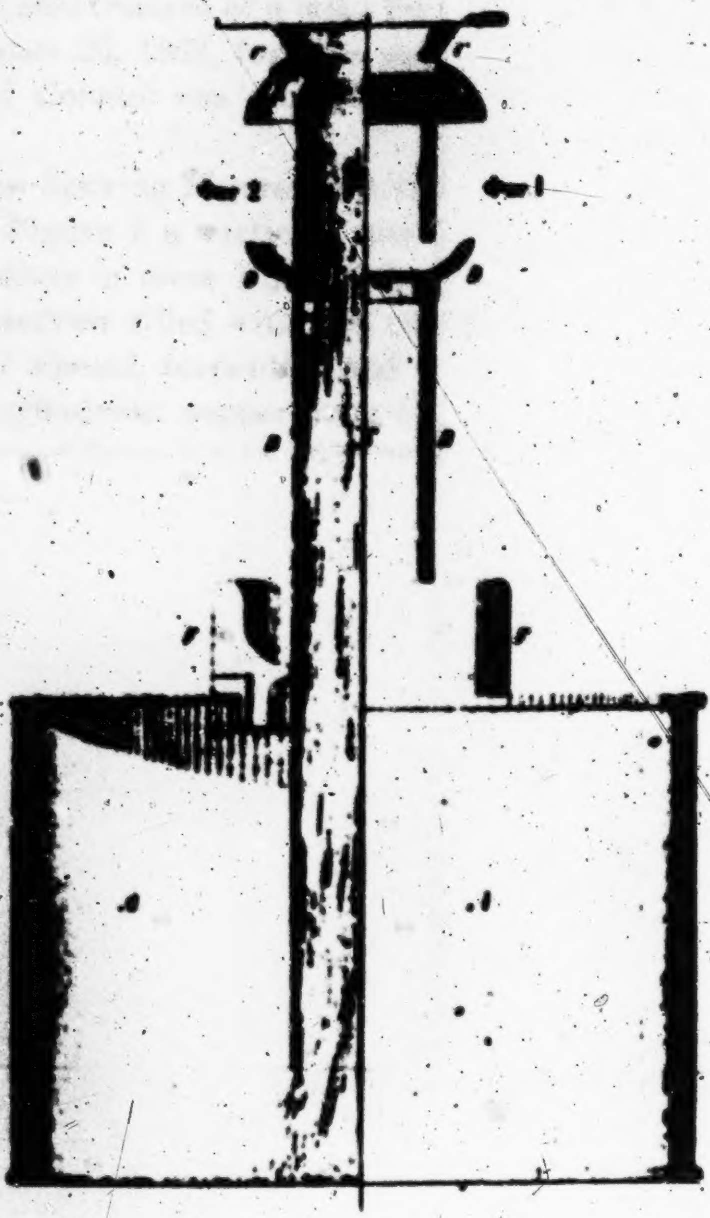
H. GARDNER,
Patent Agent, 166 Fleet Street, London,
Agent for the said Henry Salsbury.

London: Printed for Her Majesty's Stationery Office, by Darling & Son, Ltd.—1896.

Von Der Weide, Russian
No 1261 of 1869
Deft's Ex. 8

[illegible]

6.8 1864



1261

Defendant's Exhibit C 1009
Translation from Russian
Von der Weide Patent

1261. 68-1869. Drawing
To patent granted to von der Weide.
Page 161.

68) Patent granted to Colonel von der Weide on special construction of a lamp for railroads; issued November 20, 1869, for five years, upon application of Colonel von der Weide of February 14, 1869.

In the drawing Figure 1 is a side elevation of the lamp, Figure 2 a vertical cross section of same. 1010
The letters in these Figures designate: A—a copper reservoir filled with fuel consisting of a mixture of alcohol, turpentine and carbon disulphide; B—a cylindrical copper tube from 7" to 8¾" in height and from ¾" to 1" in diameter; C—copper horn of frustroconical form with smooth top surface, under which is disposed an exterior oval globe in the shape of a parasol, which facilitates a more complete combustion of gaseous products; in the bottom portion of this horn are provided perforations for free passage of the fuel vapors; D— 1011
annular copper cup soldered around the cylindrical tube B at a distance of 1½" from the top surface and serving for the receiving of liquid fuel by which the horn C is heated; E—the wick of cotton threads fitted into the cylindrical copper tube B; F—a threaded copper ring fastened to the cylindrical tube B and connected hermetically with the reservoir A with the aid of a rubber plate.

The invention has been examined in the Department of Railways and in the Councils of Manufacture and the Ministry of Finance, but the patent

1012 is issued to the effect that it is restricted to the exterior oval globe (hood) or parasol facilitating the more complete combustion of the gaseous products, but does not extend to the other constituent parts of the above described lamp.

1013

1014

W. HATHAWAY.

Lamp-Burners.

No. 147,496. Patented Feb. 17, 1874.

Fig. 1.

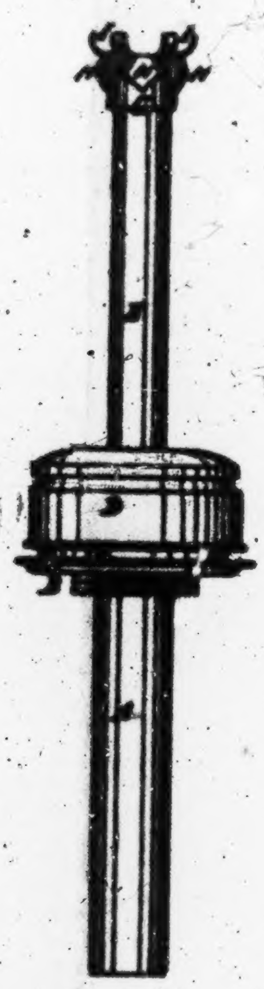
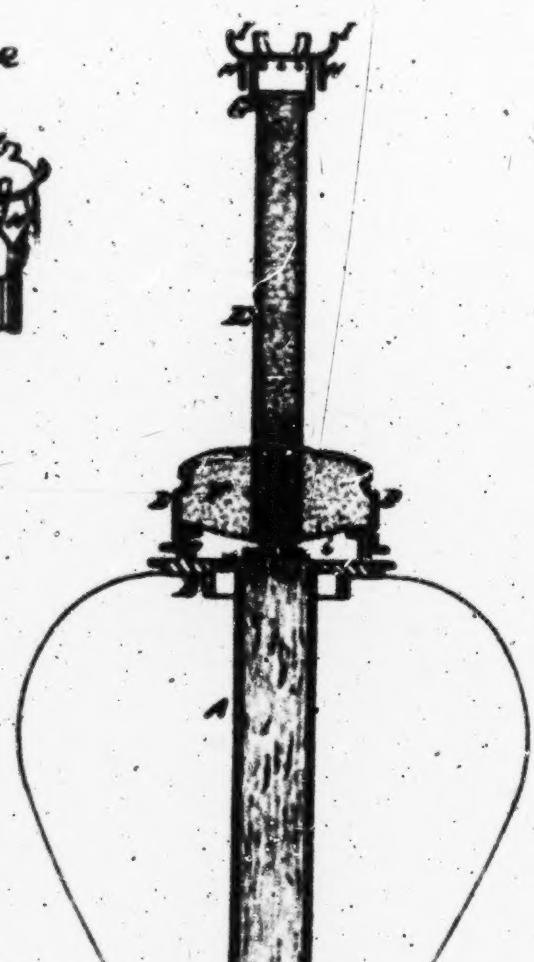


Fig. 2

Fig. 3.



Witnesses
John L. Boone
C. Milton Richardson

Welcome Hathaway
by Dewey & Co
Attys

UNITED STATES PATENT OFFICE.

WELCOME HATHAWAY, OF OPHIR, CALIFORNIA.

IMPROVEMENT IN LAMP-BURNERS.

Specification forming part of Letters Patent No. 147,496, dated February 17, 1874; application filed December 18, 1873.

To all whom it may concern:

Be it known that I, WELCOME HATHAWAY, of Ophir, county of Placer, State of California, have invented an Improved Burner for Lamps; and I do hereby declare the following description and accompanying drawings are sufficient to enable any person skilled in the art or science to which it most nearly appertains to make and use my said invention or improvement without further invention or experiment.

My invention relates to an improved burner which is especially adapted for burning gasoline and other light products of a similar nature, such as are brought to the burner and vaporized previous to being ignited.

My invention consists in a cap or coupling for holding the upper part of the wick-tube, and so constructed that it contains a removable non-conducting substance and a small gas-chamber. It also consists in a peculiarly-constructed burner, as more fully hereinafter described. A combination of inflammable and non-inflammable substances is employed to conduct the gasoline or other fluid to the vaporizer and burner.

Referring to the accompanying drawing for a more complete explanation of my invention, Figure 1 is a side elevation of my device. Fig. 2 is a view of the burner or cap. Fig. 3 is a sectional elevation of the device.

A is the tube, which is made of such length that it will reach from near the bottom of the lamp or receptacle for the liquid to a point just above the top of it. A screw-cap, B, fits into the top of the lamp in the ordinary manner, and just above this screw is another screw-cap, C, which forms the lower part of the coupling. The upper part of the coupling D fits down upon the screw C', and has a hole through its top somewhat larger than the tube E. The interior of the part D is closely filled by a cork, F, through which the tube E passes, fitting closely, and it is thus prevented from touching the sides of the coupling D. This makes the device non-conducting, and no matter how hot the tube E may become, the heat will not pass down so as to affect the tube A. A broad flange is formed upon the top of the screw C, and when the parts are screwed together, a tight joint will be formed by the cork which presses upon the flange, and a small gas-chamber, *i*, left beneath the cork.

The lower tube A may be filled with cotton-wicking; but the upper tube E should be filled with asbestus, which will not be acted upon by heat, the asbestus just resting upon the wick when the parts are united.

The burner or vaporizer G is placed at the top of the tube E, and consists of a cap which fits upon the top of the tube. This cap is closed at the top, and has a series of horizontal holes around it near the top. A series of lips, H, are formed to bend down from the top all around the cap and between the jet-openings, so that each jet passes out between two of these lips, and is thus protected from air-currents, and while the lamp is being carried from place to place, so that it is not easily extinguished. Above the jet-openings are a series of lugs, I, which may be bent upward or more horizontally if it is necessary to have a greater heat for more perfect vaporization and combustion; and by this construction I am enabled to make my burner adjustable.

Different caps of various sizes and shapes may be employed for larger or smaller lamps; but by means of the lips H and adjustable projections I, I am always enabled to regulate and protect the flame.

The coupling C D, with its non-conducting packing, renders it impossible to overheat the liquid in the lamp, while, by extending the tube A to the bottom of the lamp inside, it will not be possible to ignite the liquid from the burner.

By making the tube E somewhat smaller than the tube A, the liquid will be carried to the burner more readily.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The burner G, consisting of the horizontally-perforated cap provided with the lips H and the adjustable lugs I, substantially as and for the purpose herein described.

2. The bisected wick-tube A E, in combination with the flanged screw-cap C, cap D, and removable non-conducting material F, constructed and arranged to form the gas-chamber *i*, as set forth.

In witness whereof I hereunto set my hand and seal.

WELCOME HATHAWAY. [L. S.]

Witnesses:

JOHN L. BOONE,

C. MILTON RICHARDSON.

PAGES - 342
AND 343 ARE
BLANK

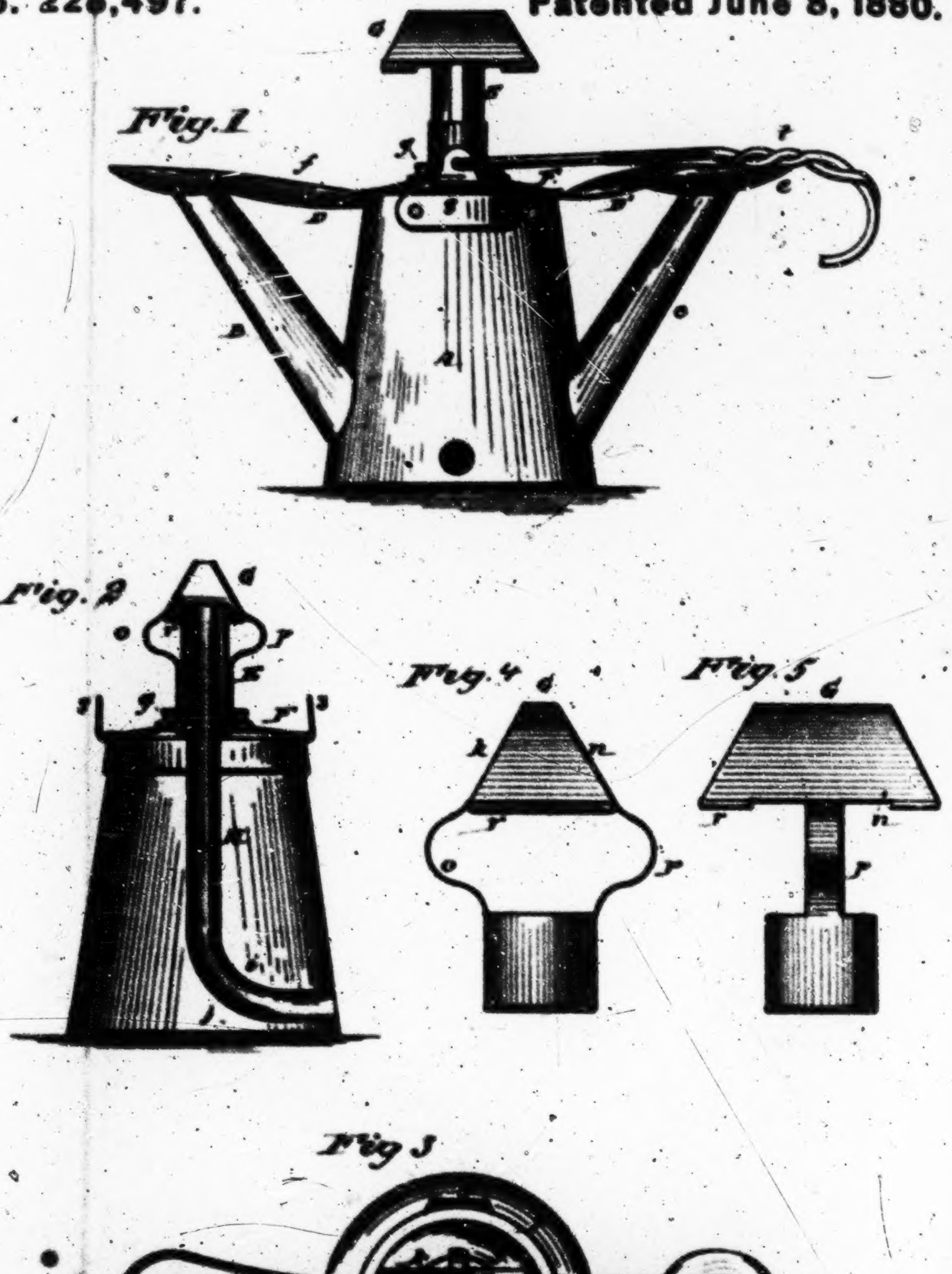
344

(No Model.)

P. WALL.

Mill-Lamp.

No. 228,497. Patented June 8, 1880.



WITNESSES

Fred. G. Dieterich

Alfred J. Krause

INVENTOR

Patrick Wall

UNITED STATES PATENT OFFICE.

PATRICK WALL, OF ALLEGHENY, PENNSYLVANIA.

MILL-LAMP.

SPECIFICATION forming part of Letters Patent No. 228,497, dated June 8, 1880.

Application filed April 17, 1880. (No model.)

To all whom it may concern:

Be it known that I, PATRICK WALL, of Allegheny, county of Allegheny, and State of Pennsylvania, have invented a new and useful Improvement in Mill-Lamps; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to an improvement in that class of lamps known as "mill-lamps" or "torch-lamps;" and it consists in providing it with three wick-tubes, a detachable burner, and a means for conveying the waste or unconsumed oil back into the body of the lamp, the central wick-tube having a central air-inlet extending from near the bottom of the lamp up through the body of it to the top edge of the wick-tube, the whole being constructed, arranged, combined, and operating as hereinafter described.

To enable others skilled in the art with which my invention is most nearly connected to make and use it, I will proceed to describe its construction and operation.

In the accompanying drawings, which form part of my specification, Figure 1 is a side elevation of my improvement in mill-lamps or torch-lamps. Fig. 2 is a vertical section of the same at right angles to the detachable burner. Fig. 3 is a top view of Fig. 1. Figs. 4 and 5 are end and side elevations, respectively, of the detachable burner.

In the accompanying drawings, A represents the body of the lamp; B C, the side wick-tubes, which are braced and stayed at their upper ends through the medium of the pieces D D', one of which serves the double purpose of brace and conductor for conveying the unconsumed oil back into the body of the lamp. The outer ends of the braces D D' surround the wick-tubes B C near their upper edge, and are dished, so as to form receptacles for the waste or unconsumed oil which flows over the upper edge of the wick-tubes B and C, which flow of oil will be in proportion to its specific gravity, the overflow always being greater when light.

The brace D', where it surrounds the wick-tube C, forms a circular dish, *e*, (shown in Figs. 1 and 3,) which does not communicate with the body A of the lamp through the medium of a channel made in the brace, like that shown at *f* in Figs. 1 and 3; but I wish it understood that the wick-tubes B and C may be furnished with either form of the braces and dished receptacles for the waste oil and come within my invention.

The center wick-tube, E, is attached to the lid F of the lamp by means of an ordinary screw-cap, as shown at *g* in Fig. 2. This wick-tube is provided with a central air-flue, H, which extends from the top edge of the wick-tube E down through it, the body A of the lamp being curved at *i* and its lower end secured to the side of the body and near its bottom *j*.

The detachable burner G consists of four inclined walls, *k*, *l*, *m*, and *n*, which converge toward a common center, the lower edge of the walls *k* and *n* being connected to two arms, *o p*, which terminate in a sleeve, which is fitted to the wick-tube E, for holding the burner G in position with relation to the upper end of said wick-tube.

The bottom or under side, *r*, of the burner G is provided with an annular opening, through which the wick-tube E passes. This opening is sufficiently large to leave a space around the wick-tube for the admission of air to the burning wick.

The body of the lamp is provided with lugs *s* for the bail *t*, which is of ordinary construction.

Mill-lamps are usually constructed of thin sheet-iron; but I prefer using sheet-iron of No. 20 to 22 gage, and braze the seams. Such construction of lamp will be much stronger, more durable, and less liable to leak oil.

The operation of my improvement in mill-lamps is as follows: The wick-tubes being supplied with wick and the lamp filled with oil, the wicks are then lighted, and the burner G is then placed on the wick-tube E, as shown in Figs. 1 and 2, which will cause the flame of the wick-tube E to burn in a broad thin sheet, the brightness of which is greatly increased by the current of air passing up through the flue H, combined with the current of air which enters the burner G through the annular opening around the exterior of the wick-tube E.

The advantage of the center wick-tube consists in being enabled to use it when combined

with the burner G for a stationary light, which is often required in a rolling-mill when making repairs.

When the lamp is used for a moving light the wicks in the tubes B and C are lighted.

The wick often carries up more oil than the flame consumes. The overflow or unconsumed oil flows down into the dish around the wick-tube, where it becomes heated and ignited, thereby causing an increase of the flame of the lamp, and any oil that is not consumed by the flame is returned to the body of the lamp through the medium of the conducting-channel *f* in the brace D, thereby preventing the overflow oil from running down the exterior sides of the lamp, which is a very objectionable thing in a mill-lamp.

Having thus described my improvement, what I claim as of my invention is—

1. In a mill-lamp, the combination of a lid provided with a detachable wick-tube having a central air-flue with a detachable burner, G, having inclined sides *k l m n* and arms *o p*, terminating in a sleeve, substantially as and for the purpose herein shown and described.

2. The herein-described mill-lamp, consisting of the body A, provided with the side wick-tubes, B C, braces D D', forming dish-shaped receptacles around the upper ends of the wick-tubes, lid F, provided with the detachable wick-tube E, having a central air-flue, H, and a detachable burner, G, provided with inclined sides *k l m n* and arms *o p*, terminating in a sleeve, substantially as and for the purpose specified.

PATRICK WALL.

Witnesses:
A. C. JOHNSTON,
J. J. JOHNSTON.

348

(No Model.)

W. HESTON.

VAPOR BURNER.

No. 270,587

Patented Jan. 16, 1883.

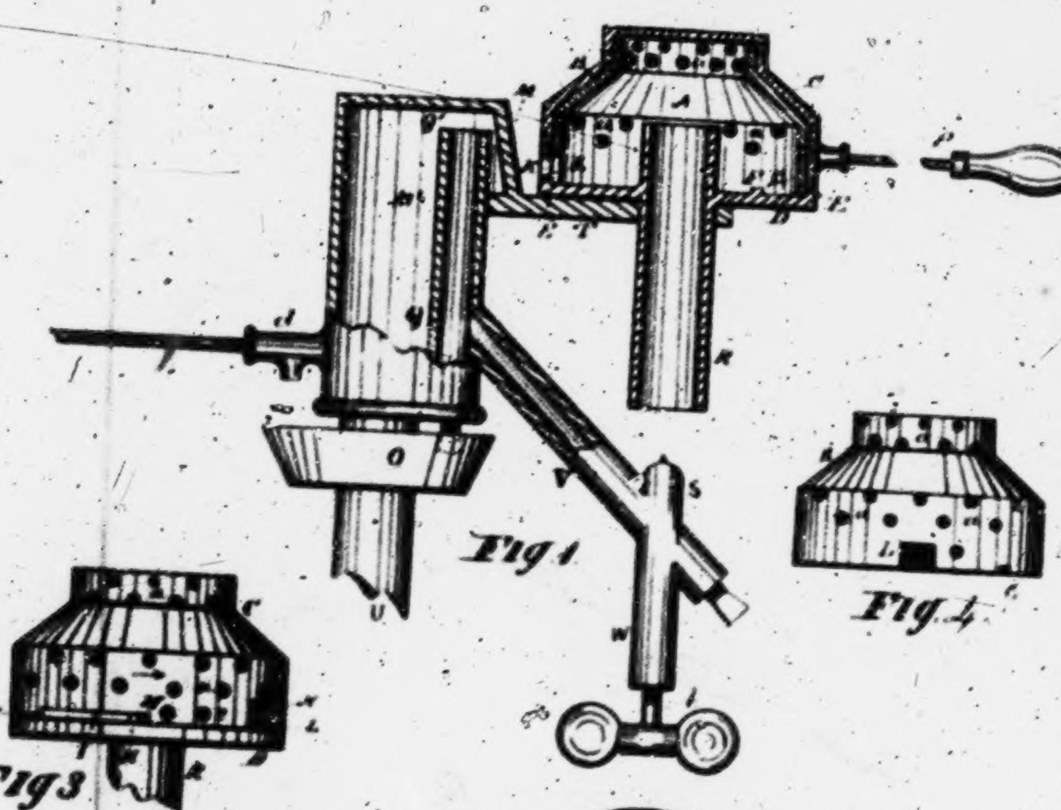


Fig. 1

Fig. 4

Fig. 3

Fig. 2

Fig. 5

Witnesses.
J. H. Burridge
W. L. Scott

Inventor
Wm Heston
Wm H Burridge
Atty

UNITED STATES PATENT OFFICE.

WILLIAM HESTON, OF MOUNT UNION, ASSIGNOR OF ONE-HALF TO JAMES E. INGERSOLL, OF BEDFORD, OHIO.

VAPOR-BURNER.

SPECIFICATION forming part of Letters Patent No. 270,587, dated January 16, 1883.

Application filed October 16, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HESTON, of Mount Union, in the county of Stark and State of Ohio, have invented a certain new and Improved Vapor-Burner; and I do hereby declare that the following is a full, clear, and complete description thereof.

This improvement relates to a vapor-burner, the nature of which consists of double perforated caps, one of which is stationary and the other movable for the purpose of regulating the flame-jets, and to cause a small jet to continue burning to avoid the trouble and delay in relighting.

The improvement also relates to the means employed for generating the vapor from the oil for combustion in the dome.

For a more full and complete description of the said improvements reference will be had to the following specification, and to the annexed drawings, making a part of the same, in which—

Figure 1 is a view of a vertical section in part of the vapor-burner; Fig. 2, a top view. Figs. 3, 4, and 5 are views of the perforated caps detached.

Like letters of reference refer to like parts in the several views.

The combustion-chamber A, Fig. 1, is inclosed by two perforated caps, B C, of which B is the inside stationary cap and C the outside movable one. The interior cap is adjusted to the base or floor D of the combustion-chamber, so as to fit on the inside of the flange E, and is prevented from turning by means of the lug or pin F, which projects from the base into a slot, G, in the lower edge of the cap, as seen in Figs. 1 and 4. This pin and slot prevent the cap from turning; but it may be readily removed and replaced, as occasion may require. The exterior cap, C, fits down over the interior one, and closes up the opening in the upper part or top of the interior one. The lower edge of the exterior cap, C, rests upon the flange E of the base D, while the interior cap is on the inside of the flange E, which flange prevents the inside cap from moving laterally, and thereby the exterior cap is also prevented from moving laterally, but is free to turn horizontally, so as to open or close the perforations in the caps, respectively. The exterior cap is permitted to turn only a certain distance sufficient to regulate the gas-jet from the perforations *a*. This is attained by means of lug H, projecting from the upper edge of the flange E into the elongated slot or opening I in the lower edge of the exterior cap. The shoulders at each end of the opening determine the distance of the horizontal rotation of the cap, as lug H forms a stop for the shoulders. When full jet-flames are required the exterior cap is turned in the direction of the arrow, Fig. 3, until the shoulder J is brought in contact with lug H, or nearly so, which will close the openings K and L and open the perforations *a* in the respective caps. The volume of flame-jets may be more or less reduced by turning the exterior cap in a reverse direction of the arrow, which will close up the perforations *a*, as required, for less heat. This closing of the perforations is due to the blank spaces of the exterior cap covering over the perforations of the interior cap. This opening and covering of the perforations in the interior cap causes more or less volume of flame to issue from the combustion-chamber A. On turning the exterior cap so that the shoulder N will be in close proximity to the lug H, the perforations of the interior cap will be closed over by the blank spaces between the perforations of the exterior cap. In this position the openings K and L will coincide with each other and will have a flame-jet issue from the chamber A through them, and impinging on the face M of the generating-chamber M′; but as the volume of flame from these joint openings is much less than from the perforations of the caps there will be less heat imparted to the chamber M′. Hence less gas is generated from the oil therein, but sufficient will be evolved to produce a low constant flame, enough at any time to cause full jets to issue from the perforations on turning the exterior in the direction of the arrow, so as to increase the heat upon the generating-chamber from the openings. In this way, after the first lighting of the burner by means of the oil-cup O, it need not be resorted to, as the burner may be fully inflamed from the result-

ant effect of the jet from the joint openings K L of the caps. When the perforations are in full-open relation with each other, so that the maximum volume of jets is attained, the perforation c, Figs. 3 and 5, will then coincide with the opening L in the interior cap, Figs. 1 and 4, to cause a jet to pass from the combustion-chamber through this space, which otherwise would be blank, and to be impinged upon the generating-chamber. It will be noted that the opening L will at all times be in the same position, directly opposite the upper part of the generating chamber, as seen in Fig. 2.

The turning of the exterior cap is so regulated or determined by the lug H, in connection with the slot I and the shoulders J N, that the cap can only be turned a given distance, and when moved to the position seen in Fig. 3 the perforations a are closed and the openings K L made to coincide, so that a light low flame ensues therefrom, and on turning the cap C in the direction of the arrow the openings K L are closed and the perforations opened accordingly.

To the cap C is connected a handle, P, for turning it.

Connected with the base or floor of the chamber A is a conducting-tube, R, which is in open relation with the needle-valve mechanism S at its lower end, the upper end opening into the combustion-chamber, as seen in Fig. 1. The tube R is supported in a bracket, T, attached to the generating-chamber M', Figs. 1 and 2, by which the combustion-chamber is held in position. To the lower end of the generating-chamber is attached a supply-pipe, U, leading to the oil-supply tank. (Not shown, as it may be same as ordinarily used for this purpose.) In the interior of the generating-chamber is a vapor-pipe, Q, closed at the lower end and open at top into the generating-chamber, as seen at Q'. This vapor-pipe forms a part of the said chamber M'.

Extending from the vapor-pipe Q, and in open relation therewith, is a branch pipe, V, which connects with the needle-valve pipe W, in which is fitted the needle-valve, the stem b thereof being provided with a handle for operating in in the usual way.

Directly under the generating-chamber and attached to the pipe U is an oil-cup, O, Figs. 1 and 2, into which oil is conveyed from the lower part of the generating-chamber M' by means of the valve-cock 4, which admits of more or less oil passing from the chamber M' into t[illegible]p, as may be required. The supply m[illegible]e stopped entirely by closing the valve-cock, the stem of which is seen at f, Figs. 1 and 2. On the oil being conveyed to the generating-chamber M' and the cup supplied, as before stated, the ignition of the oil in the cup will convey heat to the generating-chamber, causing generation of vapor from the oil, which will pass through the pipes Q V to the needle-valve pipe or chamber, thence through the conductor R into the combustion-chamber, from which chamber it issues through the perforations and openings before set forth. A portion of the flame from the chamber A passes through perforations or openings adjoining the upper part of the generating-chamber, thereby supplying the required heat for the constant generation of the gas or vapor so long as the supply of oil is continued. The upper end of the pipe Q is in close proximity, at Q', to the upper end of the generating-chamber M', by which regurgitation of the oil through the pipes on igniting the burner is arrested, as the rapid generation of gaseous vapor above the oil in the chamber will have sufficient pressure above the oil to resist the ebullition of the oil engendered by the heat from the cup O when ignited, and thereby preventing its passage through the pipes to the combustion-chamber.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In vapor-burners, the two perforated caps B C, arranged one within the other, the interior one being stationary and the exterior one movable therein, and provided with openings K L, slot I, and lug H, in combination with the pipe R and needle-valve mechanism, substantially as described, and for the purpose set forth.

2. In vapor-burners, an improvement consisting of double perforated caps B C, provided with openings K L, the interior cap being stationary and adjusted to the floor of the combustion-chamber within the flange E, and the exterior cap, C, inclosing the said cap B and turning upon the same, in combination with the pipe R, generating-chamber, and needle-valve mechanism, substantially in the manner as described, and for the purpose specified.

3. In vapor-burners, the combustion-chamber having a stationary and movable cap, slot I, and pin H, with a pipe extending from the needle-valve mechanism into the interior of said chamber, in combination with the bracket T, generating-chamber, openings K L, and pipes Q V, arranged substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM HESTON.

Witnesses:

W. H. BURRIDGE,

J. H. BURRIDGE.

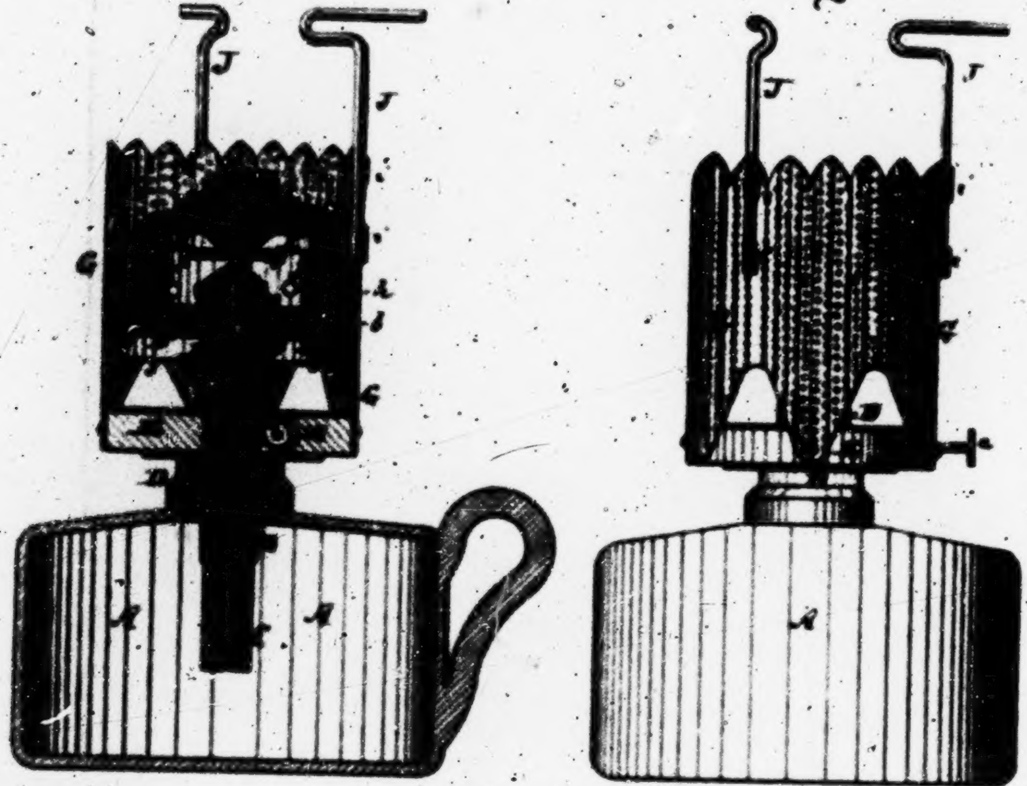
KODAK SAFETY ▲ FILM

T. R. ALMOND.

VAPOR BURNERS FOR HEATING PURPOSES.

No. 193,796. Patented Aug. 7, 1877.

Fig. 1 Fig. 2



Witnesses

D. Briesen

J. Fink

Inventor

Thomas R. Almond

by his attorney

A. v. Briesen

UNITED STATES PATENT OFFICE.

THOMAS R. ALMOND, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN VAPOR-BURNERS FOR HEATING PURPOSES.

Specification forming part of Letters Patent No. 193,796, dated August 7, 1877; application filed December 15, 1876.

To all whom it may concern:

Be it known that I, THOMAS R. ALMOND, of Brooklyn, in the county of Kings and State of New York, have invented a new and improved Burner for Heating Purposes, of which the following is a specification:

Figure 1 is a sectional elevation of a lamp carrying my improved burner. Fig. 2 is a side view of the same.

Similar letters of reference indicate corresponding parts in both figures.

This invention relates to an improved lamp-burner for heating purposes, the object being to vaporize, by an inner flame, the fuel of the lamp, and to produce a heating-flame by igniting said vapors or other gases.

The invention consists, first, in the combination of a sliding wick-tube, which is moved up and down with the wick through a fixed annular plate, with a top plate, which, when drawn down, serves as an extinguisher.

The invention also consists in providing said annular plate with perforations, or with a perforated rim, and in combining it with a narrow superposed chamber, and with a perforated outer chimney, all as hereinafter more fully described; also, in the use of a hinged cap, and in the new arrangement of brackets for supporting the vessel to be heated.

In the drawing, the letter A represents the reservoir of a coal-oil lamp. B is the wick-tube, and C the wick thereof. The wick-tube is arranged to slide up and down in a hollow guideway, D, that projects from the lamp-reservoir. In this guideway the ratchet-wheel *a*, for moving the wick-tube, has its bearing.

A wooden or other bad heat-conducting base-block, E, is rigidly affixed to the tubular guideway D, and elevated sufficiently far from the reservoir A to keep the flame above from unduly heating the reservoir. This block, together with the tube D, is, by preference, covered with asbestus-paper or other non-combustible substance. The upper end of the stationary tube D terminates in an enlargement or flange, F, in form of an annular plate of slightly smaller diameter than the block E. The plate F has an upwardly-projecting perforated rim, *b*, or is itself perforated.

The wick-tube has an inner cross-bar, *d*, upon which is mounted the vertical stem *e* of a top plate, *f*. This top plate is at a distance above the upper end of the wick, and larger in diameter than the wick, as shown in Fig. 1. By means of the ratchet-wheel *a* the tube B, wick C, stem *e*, and plate *f* are raised or lowered together.

The wick-tube embraces the wick to a short distance from the upper end of the wick. By having a sliding wick-tube I am enabled to raise the flame of the wick to a greater height within the burner without exposing a larger proportion of wick-surface to the action of the flame. The plate *f* serves the purpose of an extinguisher when drawn down upon the plate F.

G is a perforated tube, of a diameter equaling that of the block E. It is, at its lower end, fastened to the periphery of the block E, and extends upward, as shown. To the inner side of this perforated tube is secured the rim *g* of a short tube, H, which surmounts the rim or body of the plate F. The tube H is preferably of smaller diameter than the plate F, and has a connecting step or shoulder, *h*, that joins it to the rim *g*, as clearly indicated in Fig. 1. This shoulder *h* rests on the upper edge of the rim *b*, or directly on the perforated plate F, if the rim *b* is omitted. Shortly above the shoulder *h* the tube H is perforated with holes of considerably larger diameter than the holes of the tube G or rim *b*.

The upper end of the tube H is closed by a hinged cap, I, which can be swung open by hand or by raising the plate *f* against it.

J J are wire brackets placed into sockets *i i*, that are formed by bending and partly cutting the tube G, in manner clearly shown in the drawing. By this construction the brackets are removable and reversible, and yet firmly supported when used.

In use the flame is started by igniting the upper end of the wick and then closing the cap I upon the tube H. The wick-flame burns then in a chamber, H, to which a small proportion of air is admitted through the rim *b* or plate F, and from which gases can freely escape through the comparatively large holes in the tube H. In other words the flame is reduced to the bare possibility of existence, but not entirely stifled, and is thus utilized as a means of vaporizing all that proportion of

fuel which, were it not for the lack of draft referred to, would be directly ignited on the wick.

The vapors thus created, or other combustible gases, escape through the holes of the tube H into the annular space formed between said tube H and the tube G. In this space the vapors or gases meet a supply of fresh air, which reaches them through the apertures of the tube G, and, when ignited, produce a perfect heating-flame, useful for many purposes in the arts. The perforated tube G gives direction to these heating-vapors, and yet admits sufficient air to supply it with the requisite quantity of oxygen.

Experience has shown me that without the tube G the degree of combustion and good heating-flame will not be obtained.

I claim as my invention—

1. The sliding wick-tube B, combined with the cross-bar d, stem e, and extinguisher-plate f, substantially as herein shown and described.

2. The cap I, combined with the chamber, which is formed by the perforated tube H and plate F, substantially as herein shown and described.

3. The perforated tube G, made with sockets i i, and combined with the brackets J J, substantially as herein shown and described.

4. The combination of the outer perforated tube G with the inner perforated tube H and connecting shoulder h, all arranged to constitute a combustion-chamber for vapors or gases that pass through the horizontal perforations of the tube H, above the shoulder h, into the tube G, substantially as specified.

THOS. R. ALMOND.

Witnesses:

ERNEST C. WEBB,

F. v. BRIESEN.

356

(No Model.)

I. E. BLAKE & H. RAUCHFUSS.

HYDROCARBON BURNER.

No. 453,335. Patented June 2, 1891.

Fig. 2

Fig. 1

Fig. 4

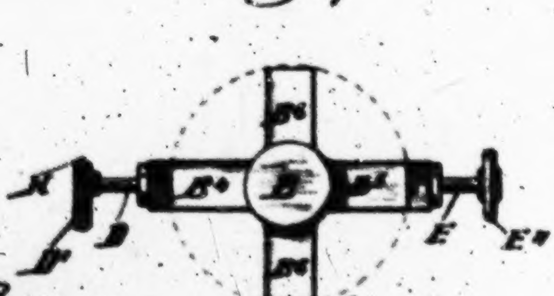


Fig. 3

Witnesses
Jesse Elliott
Celeste P. Chapman

Inventor
Isaac E. Blake
Herman Rauchfuss
By Burton and Burton
Attorneys

UNITED STATES PATENT OFFICE.

ISAAC E. BLAKE AND HERMAN RAUCHFUSS, OF DENVER, COLORADO.

HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 453,335, dated June 2, 1891.

Application filed April 17, 1890. Serial No. 348,300. (No model.)

To all whom it may concern:

Be it known that we, ISAAC E. BLAKE and HERMAN RAUCHFUSS, citizens of the United States, residing at Denver, county of Arapahoe, and State of Colorado, have invented certain new and useful Improvements in Hydrocarbon Illuminating Burners, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

Figure 1 is a side elevation of our improved burner. Fig. 2 is a vertical axial section through the line 2 2 on Fig. 3, said Fig. 3 being a plan with the shield removed. Fig. 4 is a section at 4 4 on Fig. 1.

This application is for an invention related to another invention for which our joint application, Serial No. 348,301, is filed simultaneously herewith, and we do not design in this application to claim specifically anything which is shown in the other application above named.

This invention is designed to facilitate the use of hydrocarbon oils for illumination, and is adapted for use with the lighter and more volatile oils—such as naphtha or gasoline—which vaporize at a moderate heat.

It consists in improved devices whereby a minimum flame is maintained and protected from extinguishment and converted into a maximum flame when desired. The devices employed are designed also to make the maximum flame consist of radiating jets rather than a continuous integral flame.

In the drawings, A is the supply-tube and vaporizing-chamber, which is filled with any suitable absorbent and porous substance A', which checks the flow of the fluid to the burner and retains the heat after the burner is lighted, causing the fluid which is conducted into it to be vaporized in its pores. The tube or stem A is cast in one piece with or brazed at the upper end to the burner-tip B. Two ducts B' and B^2 extend through the burner-tip from the chamber in the stem A to the spreading-chamber B^3, formed in the upper end of the burner-tip B. This spreading-chamber might properly also be called a "vaporizing-chamber," since before the burner becomes hot enough to cause the formation of vapor in the stem A the liquid will be vaporized in this spreading-chamber B^3. Fine orifices b^3 lead from the chamber B^3 through its wall outwardly, said orifices being arranged in a horizontal plane discharging radially from the chamber, and through them the vapor is discharged in jets and is ignited on the outer side of the chamber. The tip B is formed with four radial arms B^4 B^5 B^6 B^6, extending horizontally from its base, and we provide the shield C, so named from its function, as hereinafter explained, which is a hollow cylinder having an opening through its base large enough to allow it to be passed down over the upper end of the burner-tip, and which rests upon the four radial arms B^4 B^5 B^6 B^6. The base C' of the shield C is perforated, said perforations c' being distributed over its entire surface and designed to admit air freely into it from below. Its cylindrical wall is pierced by apertures c^2, equal in number and in line radially with the orifices b^3, respectively leading from the spreading-chamber B^3.

Through the arms B^4 and B^5 holes are drilled into the ducts B' and B^2, respectively, and screw-valves D and E, suitably guarded about their stems with stuffing-boxes D' and E', are provided, entering through said holes and seating across said ducts B' and B^2, respectively. Directly above each of these valves simple screw-valves F and G are inserted through the arms D^4 and D^5, respectively, and seated in and adapted to close the ducts B' and B^2, respectively, above the seats therein of the valves D and E, respectively. These latter valves F and G are preferably made with slender tapering points, and their seats are of course similarly formed, whereby they are adapted to be very accurately adjusted. The valves D and E may not be so slender, but may cease more abruptly. The valve D we prefer to provide with a sheave-handle D', to which a chain H may be connected for convenience in operating it. The valve E may have no handle at all, or may be provided with a handle E'', as shown; but the valves F and G are preferably without handles, but may be slotted at the exposed ends to be operated by a screw-driver. These latter valves are designed to be so tightly fitted in their threads as to require no stuffing-boxes, and to be adjusted not too easily even by means of a screw-driver, and incapable of adjustment by the fingers without a tool.

This burner is designed to be used in the following manner: The valve E being closed and the valves F and D being open and the valve G either open or closed, it being at this stage a matter of indifference whether it is open or closed, the fluid admitted through the pipe A and contained in the porous material A′ flows up through the duct B′, and, overflowing in the chamber B² and flowing out through the orifices b^3, will be ignited upon the outside of the burner-tip. It will be understood that for this purpose the shield C may be temporarily removed. The valve D may now be closed, or so nearly closed as to admit a very slight quantity of oil past it, the oil which has overflowed and such additional quantity, if any, as may be supplied past the valve D burning freely until the entire burner-tip B and the tube A, connected to it, are sufficiently heated to cause the fluid contained in the porous contents A′ of the tube A to be vaporized therein, so that the discharge from the orifices b^3 is no longer oil, but vapor. It will be understood that if the valve D has been closed entirely after the first discharge of oil past it, as described, it must be opened again before the oil so discharged is entirely burned up, in order that the vapor or vaporized oil in the tube A may be admitted to the burner-tip to maintain the flame. The valve D will now be opened wide, and the valve F will be screwed in until the discharge of vapor past it is limited to such amount as can be continuously generated in the chamber A. This amount and the consequent adjustment of the valve F will be determined by the judgment of an expert or by sufficient experiment to ascertain it reliably, and the valve F, having been once set at this position, need never be changed, except when a different grade of oil is to be used, which may change the conditions. The valve D being now closed entirely, and the valve E opened wide, the valve G will be adjusted to such position that it will admit past it only the least quantity of vapor, which will maintain the temperature of the burner at the vaporizing-point. This valve, being thus adjusted, will need no change unless a different character of oil is to be used, which may require a greater volume to maintain the same temperature, or which vaporizes at a different temperature. It will be seen that when the valves F and G are thus adjusted the flame may be increased from the minimum which can be maintained to the maximum that the burner is capable of supplying reliably by opening the valve D to any desired extent, and that, once lighted and properly adjusted, the flame will never be extinguished entirely, and the burner may therefore be operated with as great convenience as a burner fed by a gas-supply and provided with automatic lighting attachments, so that the process of first flooding the burner with oil and watching it until it begins to vaporize and then with care requiring an expert adjusting it to the proper point each time it is used is dispensed with. If at any time it is desired to extinguish the burner entirely, as when the light is not to be required for a long time, as for several days or weeks, the valve E will be closed as well as the valve D; but in the ordinary intervals of use from night to night the valve E will be left open and the flame maintained at the minimum, controlled by the valve G, as described.

It will be apparent that the slight flame formed when the valve D is closed and the vapor is admitted only past the minimum valve G would be liable to be extinguished by drafts of air, and also that the large flame might be rendered unsteady and might be extinguished at some of the orifices momentarily by air-blasts accidentally directed upon it if no protection were afforded for the flame. To afford such protection is the purpose of the shield C. This shield has the bottom C′ perforated, as already described, the intention being to admit an abundant supply of air to the flame, but to so thoroughly break it up that it shall be distributed evenly and not at any time reduced to a blast at any one point. The shield entirely encircles the burner-tip and is closed at the top, and has the apertures c^3, which are radially in line with the apertures b^3 in the burner-tip B. The apertures c^3, however, are very much larger than the orifices b^3, the latter being from one one-hundredth to one-fiftieth of an inch—that is, barely large enough to admit a fine needle—while the former—the apertures c^3—are from three-sixteenths to three-eighths of an inch in diameter. The jets emitted from the orifices b^3 are directed toward the apertures c^3, and when the supply-valve is opened to such an extent as to produce actual illumination from the burner these jets shoot out through the apertures c^3. When the burner is turned down—that is, when the valve D is closed, or nearly so—and the quantity of vapor admitted is that which is permitted by the valve G, the jets barely protrude from the orifices b^3, or at least do not extend far enough to be visible outside the shield C. In practice a bare blue point of flame is visible at the orifices b^3 when the supply of vapor is at the minimum as controlled by the valve G.

We claim—

1. In a vapor-burner, in combination with the fluid-supply pipe and the burner-tip and a duct communicating from the supply-pipe to the tip, and the valve controlling such duct, the tip having peripheral jet-orifices in horizontal plane, through which the vapor is emitted radially, and a shield encircling and covering such tip and having peripheral openings in a horizontal plane radially in line with the jet-orifices, respectively, and through which the flame can extend when the controlling-valve is sufficiently opened, substantially as set forth.

2. In a hydrocarbon-burner, in combination with the supply-pipe and the burner-tip,

two ducts which communicate with the supply-pipe and the tip, a limiting-valve seating in each of said ducts, one of such valves being adjusted to the minimum and the other to the maximum of the desired supply, the third valve controlling the duct which has the maximum limiting-valve, the burner-tip having peripheral jet-orifices in horizontal plane, through which the vapor is emitted radially, and a shield C, encircling and covering such tip and having in a horizontal plane peripheral flame-orifices c^2, which are radially in line with the jet-orifices, respectively, whereby the jets of flame emitted from the jet-orifices are caused to extend out separately and divergently in a horizontal plane through said flame-orifices, substantially as set forth.

3. In a vapor-burner, in combination with the burner-tip having jet-orifices located in a horizontal plane and discharging radially, a shield encircling and covering such tip and inclosing a chamber between the tip and the shield, the latter having peripheral apertures in a horizontal plane in line radially with the jet-orifices, respectively, and larger than the latter, whereby the flame formed at the jet-orifices is shielded from exterior currents of air until it is emitted through the shield-apertures, substantially as set forth.

In testimony whereof we have hereunto set our hands, in the presence of two witnesses, at Denver, Colorado, this 11th day of April, 1890.

ISAAC E. BLAKE.
HERMAN RAUCHFUSS.

Witnesses:
C. B. COWELL,
M. MCMULLIN.

PAGES - 360

AND 361 ARE

BLANK

No. 783,339. PATENTED FEB. 21, 1905.

W. P. WARREN.

VAPOR LAMP.

APPLICATION FILED APR. 6, 1904.

3 SHEETS—SHEET 1.

Fig: 1.

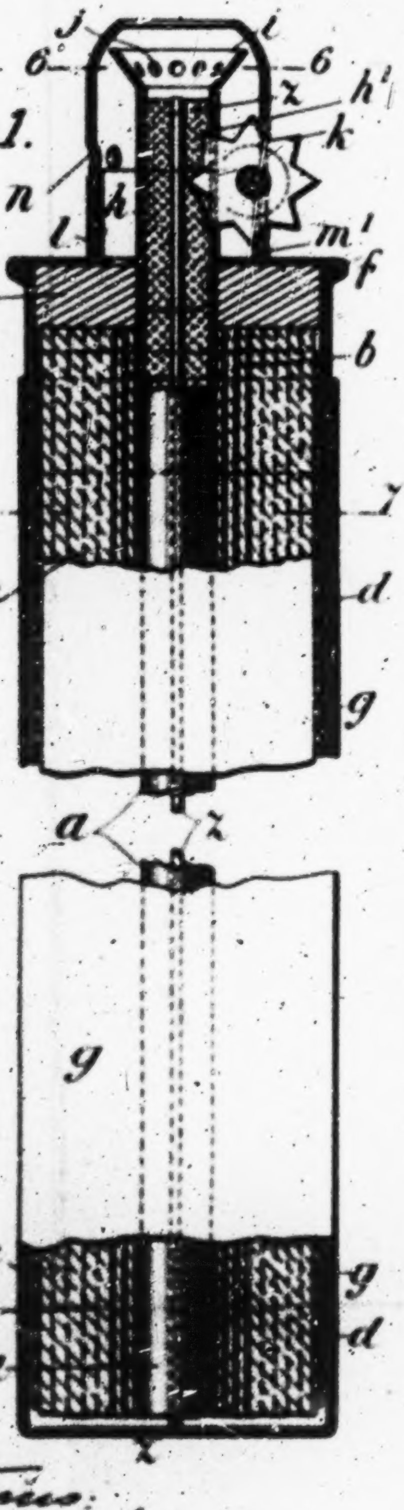


Fig. 2

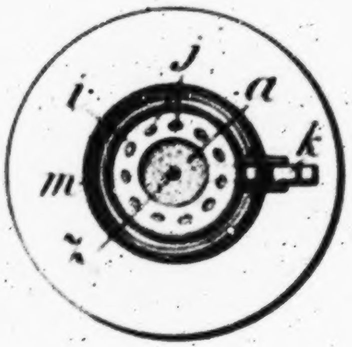


Fig 3.

Witnesses:
Stephen Ginsta
W. Max. Durall

Inventor
W. P. Warren
by Wilkinson & Fisher
his Attorneys

364

No. 783,339. PATENTED FEB. 21, 1905.

W. P. WARREN.

VAPOR LAMP.

APPLICATION FILED APR. 6, 1904.

3 SHEETS—SHEET 2.

Fig 4.

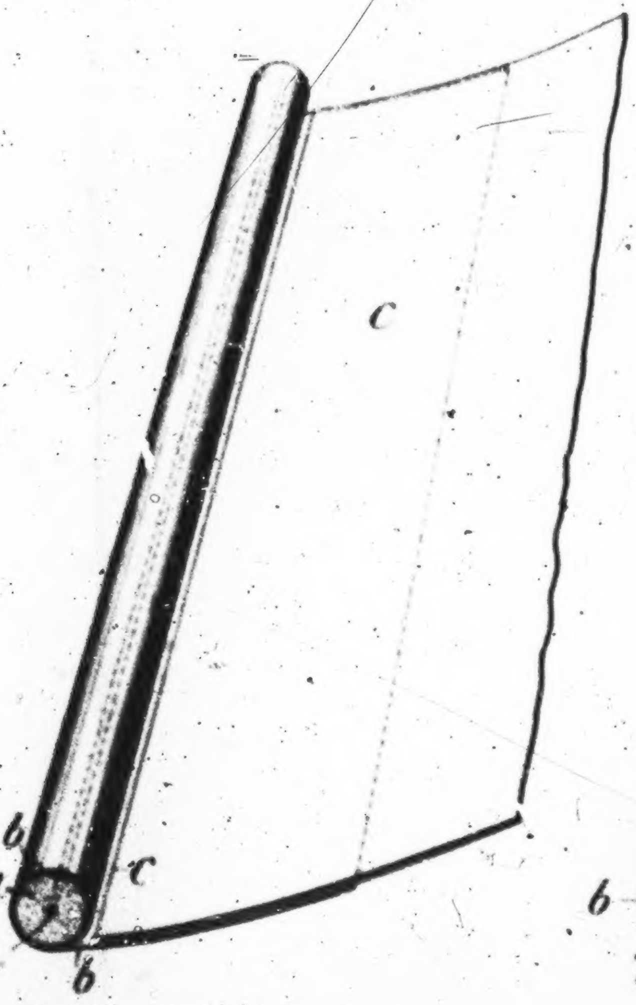
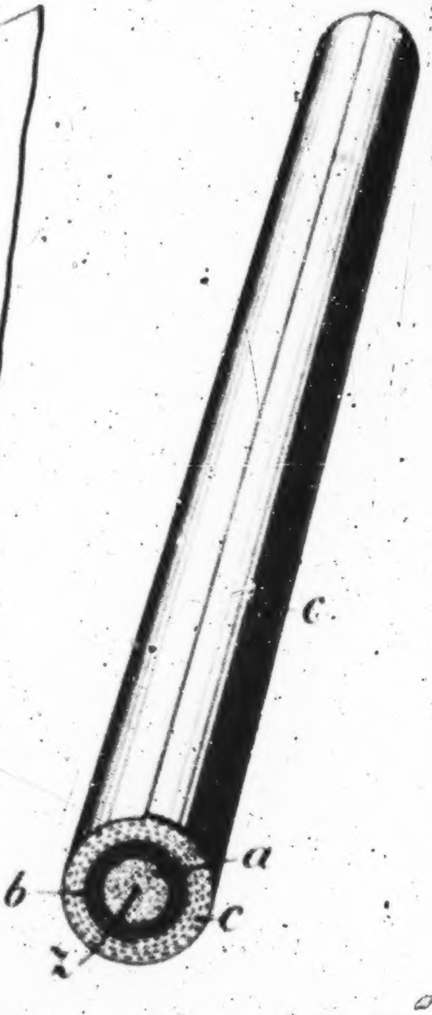


Fig 5



Witnesses:
Stephen Ginsta
W. Max Dowell

Inventor
W. P. Warren
By Wilkinson & Fisher
his Attorneys

366

No. 783,33

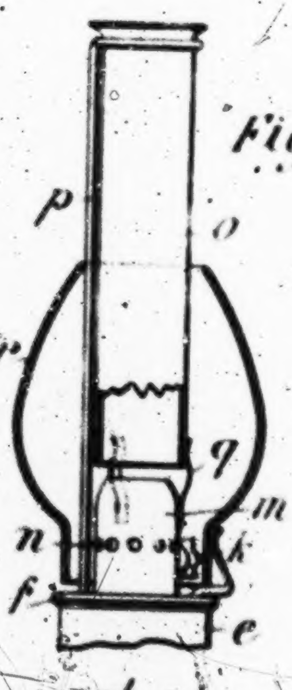
PATENTED FEB. 21, 1905.

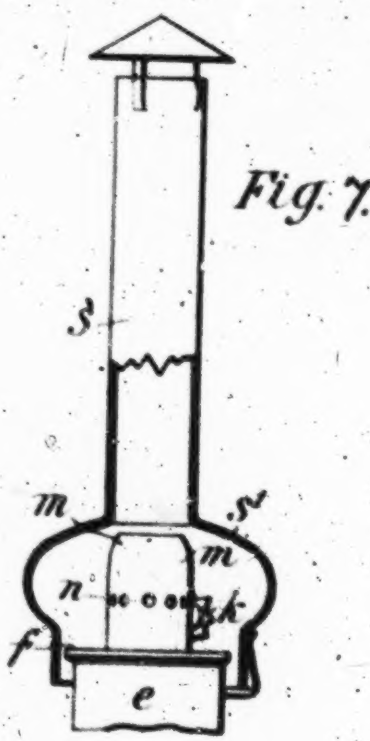
W. P. WARREN.

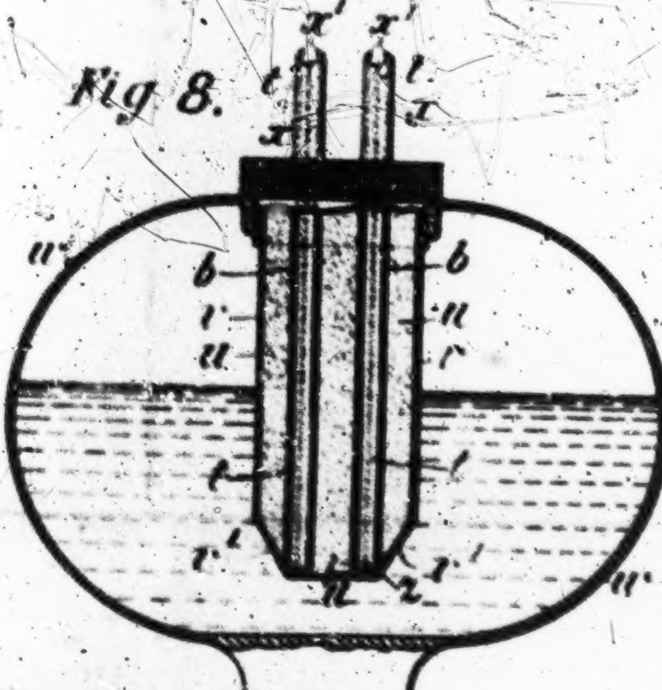
VAPOR LAMP.

APPLICATION FILED APR. 6, 1904.

3 SHEETS—SHEET 3.







Witnesses
Stephen Ginsta
W. Mas Duvall

Inventor
W. P. Warren
by Wilkinson & Fisher
his Attorneys

No. 783,339. Patented February 21, 1905.

UNITED STATES PATENT OFFICE.

WALTER P. WARREN, OF LONDON, ENGLAND, ASSIGNOR OF TWO-THIRDS TO JAMES CHARLES PAIN, JR., AND ALBERT ESCOLME, OF LONDON, ENGLAND.

VAPOR-LAMP.

SPECIFICATION forming part of Letters Patent No. 783,339, dated February 21, 1905.

Application filed April 6, 1904. Serial No. 201,666.

To all whom it may concern:

Be it known that I, WALTER PELHAM WARREN, engineer, a subject of the King of Great Britain, residing at 525 Holloway road, London, England, have invented certain new and useful Improvements in Vapor-Lamps, of which the following is a specification.

This invention relates to lamps and burners using liquid hydrocarbons; and the objects of this invention are (*inter alia*) to provide a lamp and burner which will minimize the risks attendant on the use of liquid hydrocarbons either from the leakage of the liquid through the various parts when the lamp or burner is in any other than a vertical position or from the gaseous vapors in the body of the lamp coming into contact with flame, and so causing an explosion; to provide a burner which may be employed with or without a forced draft, which automatically vaporizes the liquid, and which is free from liability to be extinguished by vibration or jar, such as is commonly experienced on ordinary road and other vehicles; to simplify the means of manipulating the wick, and to insure an even and constant supply of hydrocarbons at the point of combustion so long as any remain in the reservoir, but irrespective of the quantity of such liquid which may be in the reservoir.

In the accompanying drawings, Figure 1 is a view of the lamp and burner, the parts being shown in vertical section. Fig. 2 is a horizontal cross-sectional view through the burner part of the lamp on the line 6 6, Fig. 1. Fig. 3 is a horizontal cross-sectional view on the line 7 7, Fig. 1. Fig. 4 is a perspective view showing the absorbent filling in the act of being rolled round the wick. Fig. 5 is a perspective view of the absorbent filling rolled completely round the wick, ready for insertion in the perforated chamber. Fig. 6 is an exterior view of the burner and top part of the lamp, showing the arrangement of chimney and globe. Fig. 7 is similar view to Fig. 6, but showing a chimney with enlargement at the lower end thereof which may be used in place of a cylindrical chimney and globe, as in Fig. 6. Fig. 8 shows a modified arrangement wherein the absorbent filling is arranged in a cylinder or chamber which is only perforated or porous at the lower end thereof, and such chamber and absorbent filling is used in the position shown—viz., immersed in the reservoir containing the liquid hydrocarbons—this Fig. 8 showing a further modification—namely, two flat wicks (or a circular wick can be employed, if desired, with this reservoir arrangement)—the upper part—*i. e.*, the burner portion—being removed, same being of any suitable construction—such, for example, as the ordinary form of duplex burner, with two flat wicks.

I will first of all describe my invention with reference to the accompanying drawings as carried into practice with a circular-wick lamp.

a is circular wick, which in the case illustrated is shown as a circular core of wick material—*i. e.*, non-tubular—and in this wick I insert from end to end thereof a metal core or strip *z*, advantageously in the form of a copper wire, (which I will hereinafter refer to as the wire *z*,) the length of this wire *z* being such that at its lower end it will rest on the bottom of the lamp or bottom of the case inclosing the absorbent filling, while the upper end will extend to the top of the wick or just above same—*i. e.*, this wire extends up to the point of combustion, or thereabout—and though relative longitudinal movement is possible between the wick *a* and the wire *z* nevertheless such relative movement cannot easily take place. Thus as the wick burns away or becomes reduced in length then when the wick is raised by the star-wheel *k* (or by any other suitable means) the wire *z* is pushed down by the operator until said wire *z* rests or bears against the bottom of the aforesaid casing or reservoir, and thereafter any shaking, jolting, or vibration of the lamp (to which same is ordinarily liable to be subjected) will not cause the wick to descend, as with the assistance of this wire *z*, thus located the wick is firmly held in any position to which it is adjusted, as aforesaid. Round this core of wick material forming the wick *a* I then roll or place one complete lap or winding of blotting-paper or the like close-grained absorbent

b, (see Figs. 4 and 5,) so that said wick *a* is completely surrounded by blotting-paper *b* or the like close-grained absorbent, hereinafter referred to as "blotting-paper," and I then commence to roll or place flannel or the like open-grained absorbent material *c* next to the blotting-paper and roll about three or four laps or windings of said alternate layers of blotting-paper *b* and flannel *c*, and after these four or five laps of blotting-paper, alternating with layers of flannel, no more blotting-paper is used, and the windings are continued with flannel only or the like open-grained absorbent *c* (hereinafter referred to as "flannel") until the desired diameter or size of absorbent materials is arrived at, whereupon this roll (of absorbent materials *a*, *b*, and *c*) is now inserted in a perforated case, such as the cylindrical perforated chamber *d*, which perforated tube or chamber *d* is open at both its top and bottom ends, such tubular chamber *d* being advantageously brazed or otherwise fixed to the short downwardly-extending tubular portion *e* of the cap *f*, which supports the burner. *g* is the outer case, consisting of the solid walled cylindrical tube *g*, closed at its bottom end, and at its upper end said outer casing or envelop *g* is adapted to slide over and fit closely the tubular part *e* of said cap *f*. The oil absorbing and holding device thus formed and consisting of the wick *a* and layers of absorbent materials *b* and *c* in the perforated tube *d* I for convenience sake may term the "cartridge," from which the wick can be readily removed when desired and replaced again or replaced by a new wick of corresponding form and size, and to charge this cartridge with a supply of oil all that it is necessary to do is to slide off the outer casing *g*, then dip the cartridge for a moment in any suitable liquid hydrocarbon in any suitable vessel or holder, whereupon the absorbent material will quickly become fully charged with the liquid hydrocarbons, and the cartridge is then lifted out of the liquid (allowed to drain for a moment) and then replaced in its casing *g* and is again ready for use. The casing *g* may be secured and retained in position on the cap *f* by any suitable means. The burner for use with this round-wick cartridge is as follows: On the cap or top *f* of the cartridge there is fixed the wick-tube *h*, the bottom end of which advantageously extends a short distance below the cap *f*, so as to enter the cartridge, and at its upper end this wick-tube *h* is flared or bell-mouthed or provided with a conical top portion, such as *i*, which latter has a ring of perforations *j* provided therein, and between such flared top *i* and cap *f* this wick-tube *h* is slotted at *h'* to enable the points of the star-wheel *k* to enter the wick *a* for the purpose of raising or lowering the latter, this star-wheel *k* being a convenient device for raising or lowering the wick; but obviously any other equivalent or suitable means may be employed for this purpose.

l is a support fixed to the cap *f* to form a seating for the hood *m*, over which support *l* the hood *m* is adapted to fit down stiffly, so as to be held firmly thereon in position during the burning of the lamp and protect the flame from gusts of air and the like. This hood *m* is open at its top end and is provided with a ring of apertures *n*, located about midway of the height of said hood *m*, so as to permit an adequate supply of air to pass upward between the outside of the wick-tube *h* with flared top *i* and the interior of said hood, and thus form an efficient air-supply for the flame, said hood *m* being slotted at *m'* to permit same to fit down over the star-wheel *k*, part of which star-wheel *k* thus projects through said hood *m* to enable the wick to be raised or lowered by such star-wheel *k* without removal of the hood *m*. The star-wheel *k* may be provided with a shaft and milled head thereon to rotate in the usual manner, if desired. Any suitable chimneys may be used in conjunction with this burner; but where a chimney and globe are employed, as in Fig. 6, the chimney *o* must be supported slightly above the top of the hood *m*, so as to afford access of air over the top of said hood *m* to the flame issuing therefrom, such chimney *o* being mounted in any suitable manner—for example, by the support *p* and the spring-guides *q*—the globe *r* being mounted in a gallery of the usual or any suitable type of a character adapted to admit air at the lower part of said globe.

In Fig. 7 no globe is shown, the chimney *s* being formed with an enlargement *s'* at the lower part thereof and is supported in a gallery in about the position shown, so that air admitted at the lower end of said chimney can pass upward over the top of said hood *m* and also pass to the interior of said hood *m* through the apertures *n*, as before.

In Fig. 8 each of the two flat wicks are surrounded by blotting-paper *b*, and outside of this blotting-paper there is packed any suitable absorbent material *u*, the whole being contained in the case *v*, the lower portion only of which is perforated—namely, at *v'*—which perforated portion is immersed in the liquid hydrocarbon contained in any suitable lamp-reservoir *w*.

A wire or wires *z* is inserted in each flat wick, and such wicks when provided with wires capable of longitudinal movement in relation to such wicks and of such a length that they reach from just below the flame to the bottom of the oil-container are even without any absorbent envelop of great use in that they prevent the wicks dropping into the container if turned down too low, and such wicks can be much more easily inserted into the wick-tube than if without the wires, and

the heat conductivity of the wires tends to assist vaporization of the oil.

The wick-tubes x for table-lamp purposes may be "straight-through" tubes in the ordinary way, or for the purpose of lamps burning without a chimney—such as van-lamps, hand-lamps, &c.—the top ends of the wick-tubes x may be turned inward, as shown at x', Fig. 8, and each end of said flat-wick tubes in such case are advantageously cut away. This arrangement of inturned edge or flange x' at the top of the wick-tubes x may, if desired, be provided by forming said inturned edges x' on removable caps, the latter being adapted to slide over the wick-tubes, on which they fit down tightly.

It will be obvious that, if desired, the circular-wick burner, as herein described, may be employed independently of the cartridges a b c d and wire s—as, for example, such burner may be employed with an ordinary circular wick immersed in a body of hydrocarbon liquid in the lamp-reservoir in the ordinary way. Also it will be obvious that the aforesaid cartridges a b c d and wire s, constructed according to the present invention, may be employed with other than the precise form of burner described and illustrated, as although I have described and set forth the best forms of burner at present known to me for use in conjunction with such cartridge, nevertheless it will be obvious that any other suitable burner may be used, if desired, in conjunction with said cartridge, as aforesaid.

If desired, any suitable heat-non-conducting or insulatory material may be inserted or employed between the burner and the body or cartridge to prevent or reduce heat being conveyed from the liquid hydrocarbons in the absorbent material. For example, a washer or packing y of heat-insulating material, such as asbestos, may be inserted inside the top of the perforated chamber close under the cap f.

In forming the cartridge by rolling the two absorbent materials round the wick or round a templet corresponding to the wick a or corresponding to the flat wicks (as the case may be) care must be taken that this is done in such wise that the circular wick a (or other shaped wick, as the case may be) may be readily slid in or out of the interior space thus formed in the roll of absorbent materials b and c or other absorbent, as the case may be. It will also be obvious that, if desired, the layers of absorbent material may be placed in position round the wick (whether the latter be circular or otherwise) in other ways than by rolling or winding such absorbent materials, as aforesaid, although I consider the rolling or winding of such materials to be the simplest and easiest way to form these cartridges.

From the foregoing description it will be obvious that the wick and the absorbent materials are and must be in contact with one another or arranged in such wise that the oil held in these various absorbent materials can all (or practically all) pass readily and evenly from all parts of said absorbent materials to the point of combustion as and when required, and in practice I have found that the oil is by these means supplied for combustion in a very steady and regular manner right up to the last.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, a layer of fine-grained material surrounding said wick, and a layer of coarse-grained material surrounding said fine-grained material, in combination with means for isolating the ignition-surface of said wick from said latter-named elements, substantially as described.

2. In lamps for burning liquid hydrocarbons, a device supplying oil comprising a wick, a layer of close-textured fabric surrounding said wick and a layer of loose-textured fabric surrounding said close-textured fabric in combination with means for isolating the ignition-surface of said wick from said latter-named elements, substantially as described.

3. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, a piece of fine-grained material wound spirally about said wick, a piece of coarse-grained material wound spirally between the layers of said fine-grained material and a further winding of coarse-grained material outside of said spiral windings, substantially as described.

4. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, a layer of fine-grained material surrounding said wick, and a layer of coarse-grained material surrounding said fine-grained material, the whole wound upon a metal core, in combination with means for isolating the ignition-surface of said wick from said coarse and fine grained materials, substantially as described.

5. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, a layer of fine-grained material surrounding said wick, and a layer of coarse-grained material surrounding said fine-grained material, means for isolating one end of said wick from said latter-named elements, a perforated wall surrounding said oil-supplying device, and a suitable vessel for containing the same, substantially as described.

6. In lamps for burning liquid hydrocarbons, a device supplying oil comprising a wick, a layer of close-textured fabric surrounding said wick and a layer of loose-textured fabric surrounding said close-textured fabric, means for isolating one end of said wick from said latter-named elements, a perforated wall sur-

rounding said oil-supplying device, and a suitable vessel for containing the same, substantially as described.

7. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, a layer of blotting-paper surrounding said wick, and a layer of flannel surrounding said blotting-paper, means for isolating one end of said wick from said latter-named elements, a perforated tube surrounding said flannel, and a suitable vessel in which the whole is placed, substantially as described.

8. In lamps for burning liquid hydrocarbons, a suitable outer casing, a perforated tube constructed to fit loosely therein, a device for supplying oil within said tube comprising a wick, a layer of fine-grained material surrounding said wick and a layer of coarse-grained material surrounding said fine-grained material, and a metal core within said wick constructed to have a bearing upon the bottom of said outer casing, substantially as described.

9. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, a plurality of alternate layers of blotting-paper and flannel surrounding said wick, the whole wound upon a metal core and placed within a suitable inclosing casing, in combination with means for isolating the ignition-surface of said wick from said blotting-paper and flannel, substantially as described.

10. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, and a roll comprising alternate layers of fine and coarse grained material wound loosely thereon whereby said wick is capable of a longitudinal movement within said layers, substantially as described.

11. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, a roll comprising alternate layers of fine and coarse grained material wound loosely thereon whereby said wick is capable of a longitudinal movement within said layers, and a metal core for said wick whereon the same is guided in its movement, substantially as described.

12. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, a roll comprising alternate layers of close and loose textured fabric wound loosely thereon whereby said wick is capable of a longitudinal movement within said layers, and a metal core for said wick whereon the same is guided in its movement, substantially as described.

13. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, a layer of fine-grained material surrounding said wick, and a layer of coarse-grained material surrounding said fine-grained material, a perforated tube surrounding said device and the whole inclosed in a suitable casing, an apertured wick-tube extending above the wick provided with a bell-mouth and a projecting hood inclosing said wick-tube at a distance therefrom provided with an open top and perforated sides, substantially as described.

14. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, a layer of blotting-paper surrounding said wick, and a layer of flannel surrounding said blotting-paper, a perforated tube surrounding said device and the whole inclosed in a suitable casing, an apertured wick-tube extending above the wick provided with a bell-mouth, and a projecting hood inclosing said wick-tube at a distance therefrom provided with an open top and perforated sides, substantially as described.

15. In lamps for burning liquid hydrocarbons, a device for supplying oil comprising a wick, and a roll comprising alternate layers of fine and coarse grained material surrounding said wick, the whole wound upon a metal core and placed within a suitable inclosing casing, an apertured wick-tube extending above the wick provided with a bell-mouth, and a projecting hood inclosing said wick-tube at a distance therefrom provided with an open top and perforated sides, substantially as described.

16. In lamps for burning liquid hydrocarbons, a wick and burner therefor comprising a wick-tube adapted to surround the upper part of said wick and extend above the top of it, an outwardly-sloping apertured flange forming a bell-mouth at the top end of the wick-tube, a hood inclosing said top part of the wick-tube, extending above it, and having an air-passage between the outside of said top part of the wick-tube and the inside of the hood, said hood provided with holes to admit air to the inside thereof, substantially as described.

17. In lamps for burning liquid hydrocarbons, a wick and burner therefor comprising a wick-tube adapted to surround the upper part of said wick and extend above the top of it, an outwardly-sloping apertured flange forming a bell-mouth at the top end of the wick-tube, an open-topped hood inclosing said top part of the wick-tube, extending above it, and having an air-passage between the outside of said top part of the wick-tube and the inside of the hood, said hood provided with holes to admit air to the inside thereof, and a chimney adapted to cause or permit the convergence of air onto the outside of the flame as it rises above the central aperture at the top of the hood, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

WALTER P. WARREN.

Witnesses:
HENRY BIRKBECK,
H. D. JAMESON.

J. F. RUTZ & J. K. LUETHE.

IGNITER TORCH FOR GAS BURNERS.

APPLICATION FILED MAY 29, 1911.

1,009,184. Patented Nov. 21, 1911.

Fig. 1.

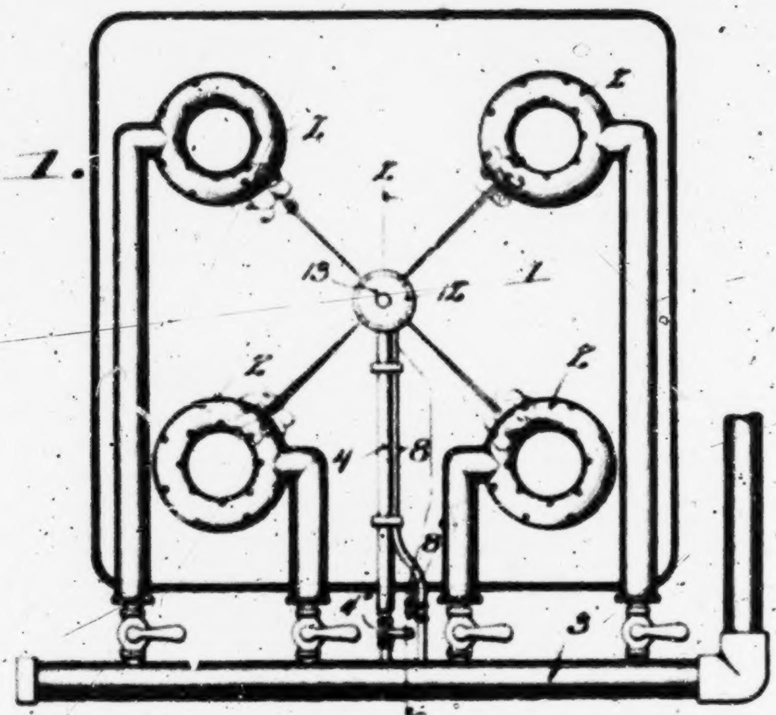


Fig. 2.

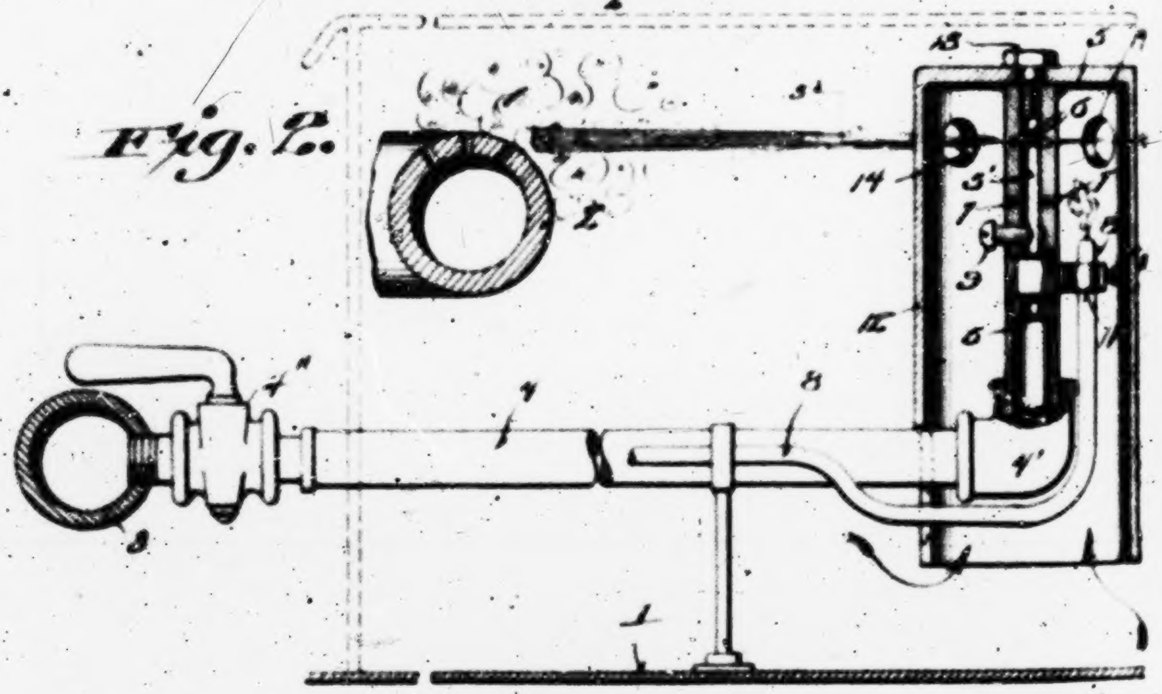
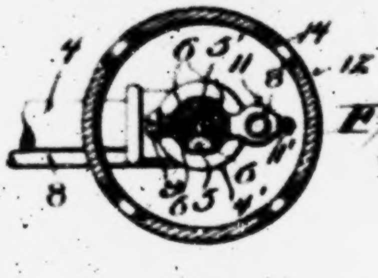


Fig. 3.



Witnesses:
Clarence Young
May Downey

Inventors:
Justus F. Rutz
Justus K. Luethe
by Clarence A. Young
Attorney

UNITED STATES PATENT OFFICE.

JULIUS F. RUTZ AND JULIUS K. LUETHE, OF MILWAUKEE, WISCONSIN.

IGNITER-TORCH FOR GAS-BURNERS.

1,009,184. Specification of Letters Patent. Patented Nov. 21, 1911.

Application filed May 29, 1911. Serial No. 630,118.

REISSUED

To all whom it may concern:

Be it known that we, JULIUS F. RUTZ and JULIUS K. LUETHE, both citizens of the United States, and residents of Milwaukee, in the county of Milwaukee and State of Wisconsin, post-office address 812 Brennan street, have invented certain new and useful Improvements in Igniter-Torches for Gas-Burners; and we do hereby declare that the following is a full, clear, and exact description thereof.

The primary object of our invention is to provide a simple, economical and effective igniter torch for gas burners.

Specific objects are to provide a single torch about which a series of valve-controlled burners are grouped within the zone and upon a plane common to individual jet flames that are discharged simultaneously from the torch; to provide a torch head incased within an apertured bell, the apertures being alined with corresponding restricted gas-supply apertures in the torch head; to provide a constant pilot light within the bell whereby the various torch head gas-discharge apertures are simultaneously ignited, the bell forming an air shield for the pilot light whereby cross-currents of air due to exterior disturbances will not snuff out said pilot light, and to provide means whereby the air for the supply of oxygen to the torch flames and pilot light is received from a lower strata than that which supplies the burners, it being well known that ignited burners will consume practically all of the oxygen in the air thereabout and thus reduce the efficiency of a centrally located constant flame.

With the above objects in view our invention consists in what is herein shown, described and claimed.

In the drawings Figure 1 represents a plan view of a gas stove provided with a torch embodying the features of our invention; Fig. 2 an enlarged partially sectional elevation of the torch and its connection, the torch being shown located within a stove which is indicated in dotted lines and having the bottom compartment in full lines and in sections, there being a cross section of a portion of a burner located upon its proper plane relative to the igniter torch. The section of the igniter torch being indicated by line 2—2 of Fig. 1. Fig. 3, a detail sectional plan view of the torch, the section being indicated by line 3—3 of Fig. 2.

Referring by characters to the drawings, 1 represents the bottom of the burner compartment of a stove, the front wall and skeleton top grid of which stove is illustrated in dotted lines. The stove is provided with a series of burners 2 under suitable valve-control and supplied with gas from a main pipe 3 in the ordinary manner. The branch pipe 4 having a valve 4'' is connected to the main pipe 3, said branch pipe being extended into the burner compartment, where it terminates approximately at the center of the same and about which point the burners 2 are conveniently grouped. Coupled to the branch-pipe 4 by an elbow 4' is a vertically disposed torch-head 5, which torch-head is provided with a longitudinal channel 5' and terminates upon a plane slightly below the top grid. The torch-head is also provided with a radially disposed gas-discharge aperture 6 for each burner, the apertures being disposed upon approximately the same horizontal plane as the burners whereby the latter are each within the zone of an individual jet flame that is emitted from the gas-discharge apertures of said torch-head when a supply of gas is admitted thereto.

The torch-head has one or more leak apertures 7 below the gas discharge aperture 6, the leak apertures being staggered in their horizontal plane relative to the plane of the gas-discharge apertures whereby the latter are readily ignited, it being understood that gas from the leak-apertures is ignited by a constant burning torch-nozzle 8, the mouth of which is in juxtaposition thereto but upon a lower plane.

The supply of gas to the various torch-head apertures is regulated by a valve-plug 9 that is in threaded union with an opening which intersects the torch head channel 5', the plug being below the discharge and leak apertures respectively and is adjusted to effect the desired control of gas thereto. The torch-nozzle 8 is formed from a small tube or pipe that communicates with the main supply-pipe 3 and adjacent to its junction therewith, is equipped with a cut-off valve 8', which, under ordinary conditions, is open, whereby gas is supplied in small quantities to the constant pilot flame. The end of the torch-nozzle is made fast to the

torch-head by its engagement with an apertured clip 11 and should it be desired to adjust the mouth of said nozzle relative to the leak apertures said adjustment can be effected by springing the pipe 8 up or down so as to change the position of the mouth of the same relative to the leak-aperture and thereafter the said pipe is secured within the clip by a set-screw 11′ that is in threaded engagement with the clip.

The torch-head 5 and pilot-light nozzle 8′ are incased in a bell 12, the top of which is secured to the upper end of said torch-head by a cap-screw 13 that is in threaded engagement with the torch-head channel 5′ whereby the same is closed. The bell 12 is provided with a series of vent-holes 14, there being one for each gas-discharge aperture. These vent-holes are of considerably larger area than the discharge apertures and are in radial alinement therewith whereby flames emitted from said apertures are directed upon the various burners to cause ignition of the latter when their valve-controlled gas pipes are opened.

It is apparent from the foregoing description that in the operation of the torch the valve 8′ of the pilot-light is normally open, whereby a small flame is constantly maintained within the bell and, owing to its inclosed position, liability of the same to be inadvertently blown out is practically eliminated. When it is desired to ignite one or all of the burners grouped about the torch the supply of gas thereto is admitted by operating their individual cocks and thereafter the valve 4″ which controls the gas-supply pipe 4 leading to the torch-head is opened. Gas will then pass out through the discharge aperture 6 and also the leak aperture 7, being slightly pocketed or confined within the top of the bell and simultaneously the torch nozzle 8′ will ignite this supply of confined gas, causing a slight explosion which, in turn, will ignite the gas from the discharge apertures 6 and the flame from each of said apertures will be flashed through the vent-holes of the bell and directed upon the various burners whereby they, in turn, will be ignited. It is apparent that should only one of the burners be open to the supply of gas no effect upon the remaining burners will be had. Attention is also called to the fact that the air for the supply of oxygen to the torch is drawn in through the space between the mouth of the bell and the bottom 1, the intake of air being thus upon a considerably lower plane than the burners, the supply of sufficient oxygen for the torch is insured and furthermore the bottom of the bell being in juxtaposition to the bottom plate 1 said bell will effectually shield the pilot-light from the disturbing influence of cross-currents of air. It will be observed that the horizontally alined vent-holes of the bell and discharge apertures 6 are so arranged for the purpose of discharging the torch flame at the most convenient point for igniting the burner.

We claim:

1. In a gas stove provided with a group of burners; the combination of an igniter torch located approximately centrally of the group, the torch comprising a vertically disposed head having a plurality of radially disposed apertures, each aperture being alined with a burner, a vertically disposed bell having a closed top incasing the head the bell being provided with radially disposed vent holes, each being in register with a head aperture, a pilot nozzle extending into the bell in juxtaposition to the head apertures, and a gas supply means in communication with the head.

2. An igniter torch comprising a vertically disposed head having a plurality of radially disposed apertures, a vertically disposed closed bell having a closed top incasing the head, the bell being provided with a series of radially disposed vent holes, each being in register with a head aperture, a pilot nozzle extending into the bell in juxtaposition to the head apertures, and a gas supply means in communication with said head.

3. In a gas stove provided with a group of burners, the combination of an igniter torch located approximately centrally of the group, comprising a valve-controlled gas supply pipe, a head in communication therewith about which the burners are grouped, the head being provided with an individual gas-discharge aperture alined with each burner and leak apertures below the gas-discharge apertures, a vertically disposed bell incasing the head provided with vent-holes each being in register with a gas-discharge aperture of the head, the mouth of the bell being upon a lower plane than that of the burners to form an air intake, means for securing the top of the bell to the head, means carried by the head for adjusting the flow of gas to its discharge apertures, and a pilot nozzle extending into the bell in juxtaposition to the leak apertures of the head and below the same.

4. In a gas-stove provided with a group of burners; the combination of an igniter torch located approximately centrally of the group, the torch comprising a vertically disposed head having a channel provided with gas discharge apertures adjacent to its upper end, each aperture being alined with a burner, a vertically disposed bell fitted over the head provided with vent-holes in register with the head apertures, the mouth of the bell being upon a lower horizontal plane than that of the burners to form an air intake shield whereby oxygen is supplied

to the torch and burner flames from different stratas of air, a cap-screw in threaded engagement with the head channel, a valve-plug carried by the head for controlling its channel, and a pilot-nozzle extending into the bell its mouth being in juxtaposition to the gas-discharge apertures of said head.

In testimony that we claim the foregoing we have hereunto set our hands at Milwaukee in the county of Milwaukee and State of Wisconsin in the presence of two witnesses.

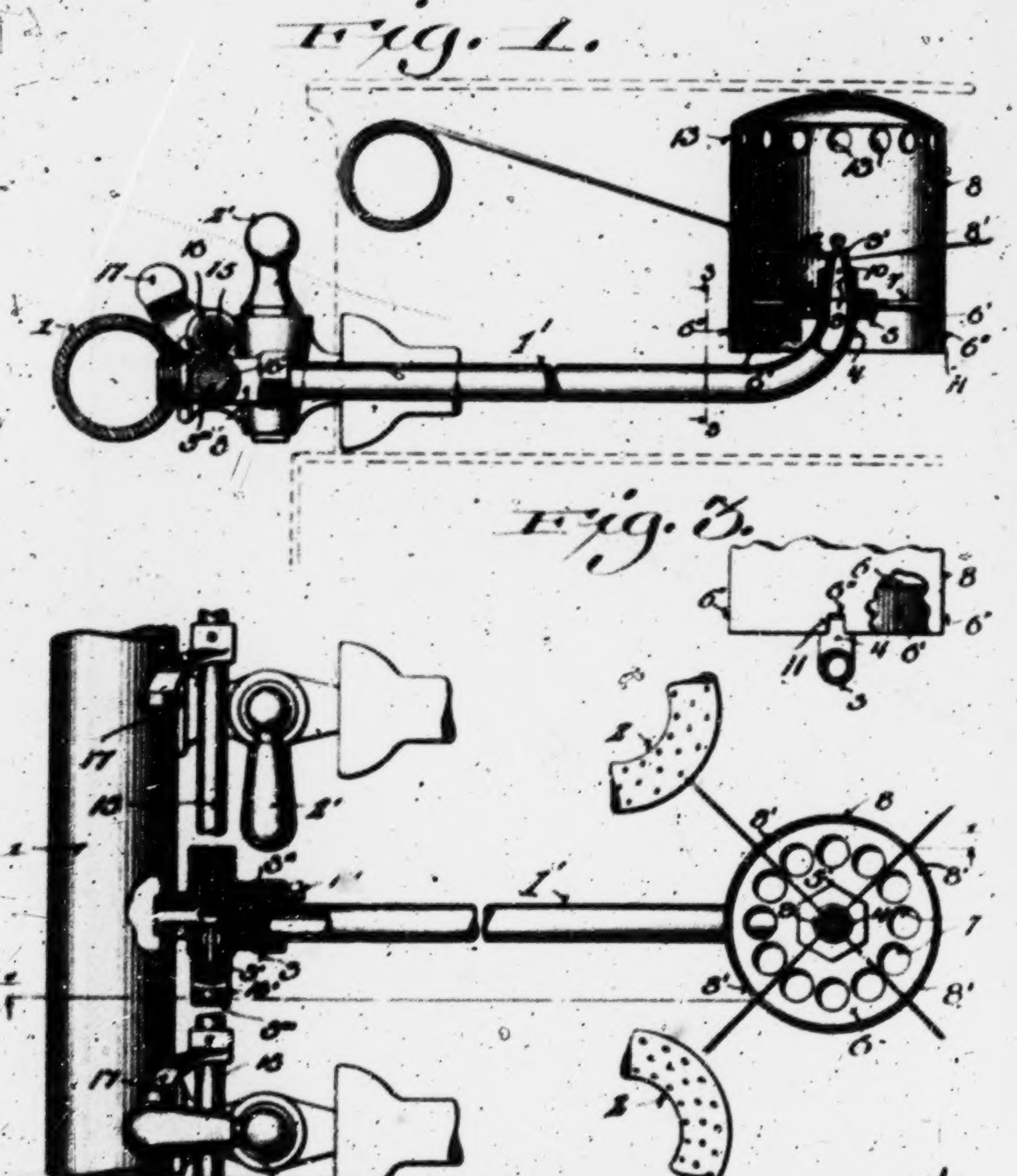
JULIUS F. RUTZ.
JULIUS K. LUETHE.

Witnesses:
GEO. W. YOUNG,
MAY DOWNEY.

PAGES - 376
AND 377 ARE
BLANK

A. O. RÜTZ.
FLASH IGNITER.
APPLICATION FILED APR. 1, 1914.

1,101,146. Patented June 23, 1914.



Witnesses:

May Downey

Inventor:

by

Attorneys

UNITED STATES PATENT OFFICE.

ARNOLD O. RUTZ, OF MILWAUKEE, WISCONSIN.

FLASH IGNITER.

1,101,146. Specification of Letters Patent. Patented June 23, 1914.

Application filed April 1, 1914. Serial No. 828,676.

To all whom it may concern:

Be it known that I, Arnold O. Rutz, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Flash-Igniters; and I do hereby declare that the following is a full, clear, and exact description thereof.

The object of my invention is to provide a simple, economical and effective flash igniter for a series of gas stove burners, the same being grouped about the igniter and within the field of entrained jets of flame, which jets are emitted from the igniter under control of the operator.

Specific objects of my invention are to provide an igniter wherein the constantly burning pilot-light and torch are combined in a single apertured tip, the same having a common gas supply that is increased intermittently to effect a lighting operation through a valve-controlled main lead having a by-pass for supplying the pilot; to provide a pressed steel removable hood for incasing the torch-head that is arranged concentric with said torch-head, whereby overheating at any particular point is obviated and the consequent generation of foul gases avoided; to provide a two-part torch-head having a hood-supporting spider clamped therein, the spider being apertured for the supply of air and also for interlocking engagement with tongues that form part of the hood; to provide a tip for the torch-head having a semi-circular head provided with obliquely and radially disposed gas discharge apertures, the crown of the tip permitting said apertures to be grouped within a small circumference, whereby restricted jets of gas flowing therefrom are caused to commingle in a single pilot-light; to provide firing ports in the hood disposed above the horizontal plane of the pilot-light, whereby said pilot-light is protected against cross-currents of air, and to provide a universal bar in connection with the controlling valve of the torch, which bar carries a series of tappets corresponding to the series of burner valves, whereby when any one of the valves are opened the torch valve is simultaneously actuated to supply the desired quantity of gas for effecting a lighting operation of the burners.

With the above and other objects in view the invention consists in certain peculiarities of construction and combination of parts as hereinafter set forth with reference to the accompanying drawings and subsequently claimed.

In the drawings Figure 1 represents a sectional elevation of a torch embodying the features of my invention, the same being shown in connection with fragments of a gas stove to illustrate its application relative to a burner and the header pipe therefor; Fig. 2, a fragmentary plan view of the same with parts broken away and in section to more clearly illustrate structural features, and Fig. 3, a detailed cross-section, as indicated by line 3—3 in Fig. 1, showing the hood and spider connection.

Referring by characters to the drawings, 1 represents a header pipe for supplying gas to a series of stove burners 2, each of said burners being controlled by a gas cock 2', the said parts constituting no part of my invention. A longitudinally disposed feed pipe 1' is connected to the gas header 1 for supplying gas to the igniter, through the medium of a valve 3 of the spring-controlled push-button type, the same being provided with a free by-pass 3'' thereabout to supply a constant restricted flow of gas to the torch head for a pilot-light. The outer end of the feed-pipe 1' is bent upwardly in a gentle curve, terminating in an exteriorly threaded nozzle 4. A nut 5 is run down upon the threaded-nozzle to form a sealing collar for a pressed steel spider 6 of the disk type, which spider has a downturned annular flange 6' and a series of vent apertures 7 cut out of its face about a central aperture through which the nozzle projects. The spider is securely bound to its seat upon the nut 5 by a similar nut 5'. The annular flange 6' of the spider is cut away at four points and the freed metal is bent outwardly to form supporting lugs 6''. The bore of the nozzle 4 is tapered outwardly for the reception of an inwardly tapered tip 9, which tip is removably socketed therein, the same being preferably composed of lava. The tip has a reduced semi-circular head 9' and its

hollow cavity 10 is semi-circularly shaped to correspond to the head forming a thin shell. In order to present an uninterrupted surface throughout the length of the feed pipe and nozzle the cavity of the tip 9 at its mouth is beveled outwardly to a feather edge to present an uninterrupted smooth surface at the point of its union with the walls of the nozzle. Thus any tendency of the flow of gas to break or spread in its travel through the two part torch-head is eliminated, the said torch-head comprising the nozzle and tip respectively.

A cylindrical hood 8 is removably fitted over the downturned spider flange 6′, the same being preferably formed from a single thin sheet-metal blank having a crowned or circular dome. The bottom edge of the cylindrical hood is provided with keying recesses 11 for engagement with the spider lugs 6″ and also a series of radially arranged firing ports 8′, which ports are disposed at a predetermined distance from the crowned dome. These firing ports are upon a horizontal plane slightly above the head of the torch-tip when the parts are assembled. The semi-circular head 9′ of the tip is provided with a series of obliquely and radially disposed gas-supply ducts 12, which ducts correspond in number to the firing ports and are radially alined therewith, but, as previously stated, are upon a lower plane and, owing to the upward inclination, an imaginary line extending in the same direction as the bore, will pass through a companion firing port to thus intersect a related gas-stove burner. The relative arrangement between the firing ports and ducts will thus bring the series of stove burners within the field of the several igniting jets of flame, although the said burners are upon a higher plane. The resulting higher plane of the stove burners, relative to the firing ports of the hood, is due to the fact that the space between the grated top of a standard type of stove and the pan thereunder is limited. Owing to this restriction and the desirability to keep the torch below the face of the stove, it is necessary to reduce the height of the torch mechanism to a compact vertical body. It is also essential to perfect combustion that the torch head tip 9′, which burns a constant pilot-flame, should be spaced at a distance equal in all directions from the walls and dome of the hood to prevent generation of foul gases through the heating of said hood. All of these features are provided for and result from the foregoing described arrangement and assemblage, it being borne in mind that the base of the torch-flame is below the line of cross currents of air and is also centrally of the hood with respect to its side walls and circular dome, and, furthermore, owing to the fact that the single restricted pilot flame is supplied by gas through the series of ducts 12, which a grouped closely about the crown of the c cular tip, gas traveling from the seve ducts, in restricted quantities, will co mingle at the top of the tip and feed the co stant pilot-flame from several dis streams, which streams will be difficult snuff out simultaneously as at least one the same is at all times protected from in vertent drafts. Thus in a contracted heig a torch is produced having all the neces qualifications with ample dome space ab the torch-head, while at the same time t pilot-light is thoroughly protected a when increased, in a lighting operation, t several flames, although below the verti plane of the stove burners, will be direc obliquely thereto.

Particular attention is called to the fa that by arranging the torch to dischar oblique flames rather than horizontal flam said flames will have a greater range t traverse the distance between the torch-he and burners to insure their ignition. Shou the flam be upon a horizontal plane it obvious that their tendency to rise as th are discharged, will materially shorten t effective range, this tendency to shorten b ing also the result of vertical cross-curre of air.

In order to insure more perfect combusti I provide the hood dome with a serie auxiliary vents 13 that encircle said do above the firing ports and hence air to su ply oxygen to the flame will be more read drawn up through the bottom of the ho and caused to pass in vertical strata ab the pilot-light and from thence through t firing ports and vents to effectually ch cross currents of air while the small pilo light is burning.

It will be understood that the flash to is effectually utilized in connection wi manufactured gas, but is particularly ef cient in connection with natural gas at hi pressure, in either instance the flow of th same being regulated by restricting or in creasing the by-pass through a set-screw 1 as shown.

It is apparent from the foregoing description that when it is desired to light any one or all stove burners grouped about the torch, the button-head 3‴ of the valve-stem 3′ being depressed, will establish direct communication between the header pipe 1 and feed pipe 1′ and the full volume of gas under pressure will instantly be discharged through the tip ducts 12, emitting independent flashes of flame through the firing ports that will envelop all burners and ignite that burner which has been previously supplied with gas from the header-pipe by turning its particular cock.

In order to avoid two distinct operations in lighting the burner, I provide a univer-

Page Tightly Bound

sal bar 15 for controlling the pilot-light valve 3. The universal bar 15 extends lengthwise of the bank of stove cocks and is automatically actuated to open the supply of gas to the igniter simultaneously with an opening movement of any one of said stove burner cocks. The universal bar, as shown, is loosely supported or guided upon the shanks of the bank of burner cocks and is capable of a reciprocative movement in one direction opposed by the spring-controlled valve-stem 3′ of the feed-pipe. For engaging the feed-pipe valve-stem I provide a metallic clip 16 having a spanner end 16′ which is adapted to engage a groove in the push-button head 3‴. The universal bar also carries a series of tappet fingers 17, which tappet fingers are positioned adjacent to corresponding burner cocks and arranged to be engaged by the finger of the operator as the burner valve is opened, such engagement causing the universal rod to move endwise, whereby the torch valve is also opened to permit a full head of gas to be supplied to the pilot-light. Thus the pilot-light and torch-head are combined in a single tip which is controlled by increasing or diminishing the supply of gas thereto.

Owing to the fact that the pilot-light is centrally disposed with relation to the hood and spaced equal distances from its walls, as previously stated, there is slight chance for the accumulation of soot or carbon therein, but, under all conditions, it is desirable to clean the hood from time to time. Hence, owing to the fact that said hood is simply supported on the spider, it can readily be removed for this purpose and when replaced, its firing ports will always be in alinement with the tip ducts due to the fact that the lugs 6″, when inserted within the recesses 11, will cause proper registration.

I am aware that flash torches of various types have been employed heretofore, some of which have utilized a separate pilot-light in connection with leads from the torch-head, which construction, when assembled within a protecting hood or bell, necessarily throws the pilot-light to one side, whereby heat radiating therefrom will cause the hood to rise in temperature unevenly, resulting in the accumulation of sooty deposits and, by combining the pilot and torch in a single tip centrally disposed with relation to the hood, these objectionable features are overcome.

Other forms of igniters have utilized a series of radial vents for feeding a corresponding separate series of pilot flames, which construction materially increases the supply of gas consumed, due to the fact that sufficient gas must at all times be fed to each vent to form a flame having a substantial volume. Each of these pilot lights are also thrown to one side of the hood with the same results as that stated with reference to a single pilot light to one side of a protecting hood or bell.

I claim:

1. A flash-igniter comprising a torch-head having a crown tip provided with radial ducts grouped to form a single pilot-light, a feed-pipe for the torch-head, a valve therefor having a by-pass for supplying a constant flow of gas to said torch-head to form a pilot-light, and a cylindrical dome provided with firing ports in radial alinement with the tip apertures but upon a slightly higher plane than said tip apertures.

2. A flash igniter comprising a torch-head having a semi-circular headed tip provided with a series of radially disposed ducts extending therethrough and grouped to form a continuous pilot-light, a valve-controlled feed-pipe for the torch-head, the valve being provided with a by-pass for supplying a restricted flow of gas to said torch-head, whereby the pilot-light is supplied, a spider secured to the torch-head, and a cylindrical hood detachably fitted to the spider, the hood being provided with firing ports in radial alinement with the tip ducts, but upon a higher plane than the latter.

3. A flash igniter comprising a torch head having a crown tip provided with radially disposed ducts grouped to supply a continuous pilot-light, a feed-pipe for the torch-head, a valve for the feed-pipe having a by-pass for supplying a constant flow of gas to the torch tip, whereby the pilot-light is maintained, and a cylindrical hood removably supported about the torch-head and concentric therewith, the hood being provided with a circular dome, the walls of which together with the side walls of said hood being approximately equal distances from the torch-tip and having a series of firing ports in radial alinement with the tip apertures, the said firing ports being upon a higher horizontal plane than the said tip apertures.

4. A flash igniter comprising a torch-head, a crown tip therefor provided with a series of radially disposed ducts closely grouped to form a constant pilot-light, a feed-pipe for the torch-head, a valve-controlled means for increasing the supply of gas to the feed-pipe, a spider carried by the torch-head, and a circular domed cylindrical hood supported about said torch-head, the hood being provided with firing ports in radial alinement with the tip ducts but upon a higher plane than the latter.

5. A flash igniter comprising a torch-head, a crowned tip therefor provided with obliquely and radially disposed gas ducts

grouped to form a continuous pilot-light, a feed-pipe for supplying a constant flow of gas to the pilot-light, a valve-controlled means for intermittently increasing the supply of gas to the feed-pipe, and a cylindrical dome supported about the torch-head provided with firing ports in alinement with the obliquely disposed tip ducts.

6. A flash igniter comprising a torch-head having a tip provided with a series of radially disposed ducts grouped to form a continuous pilot-light, means for varying the supply of gas to the torch-head, and a circular domed cylindrical hood supported about the torch-head having firing ports alined with the tip apertures upon a higher plane than the latter, the cylindrical wall and circular dome of the hood being positioned approximately equal distances from the torch-head tip.

7. A flash igniter comprising a torch-head, means for supplying a continuous flow of gas thereto, a crown tip for the torch-head having radial ducts grouped closely about the crown portion of said tip to supply streams of gas that commingle to form a single pilot light centrally disposed relative to the tip, and means for increasing the supply of gas to the torch-head ducts whereby the single pilot light is divided into individual projected burner igniter flames, and a hood supported about the torch-head having firing ports in alinement with the tip ducts.

8. A flash igniter comprising a torch-head having a tip provided with radial apertures grouped to form a single pilot-light, means for supplying gas to the torch-head tip in varying quantities, a circular spider secured to the torch-head having a downturned flange provided with lug-extensions, and a cylindrical hood having edge recesses adapted to engage the spider-lugs, the hood being provided with firing ports radially alined with the tip apertures.

9. A flash igniter comprising a torch-head having a tip provided with radial apertures grouped to form a single pilot-light, means for supplying gas to the torch-head tip in varying quantities, a circular spider secured to the torch-head having a down-turned flange provided with lug-extensions, a cylindrical hood having edge recesses adapted to engage the spider-lugs, the hood being provided with firing ports radially alined with the tip apertures, and a series of vent apertures above the firing ports.

10. A torch-head for flash igniters comprising a feed-pipe having an upturned end forming a nozzle, the bore of the nozzle being tapered, and an exteriorly tapered tip fitted into the nozzle having a cavity therein beveled outwardly to a feather edge to form an uninterrupted joint in connection with the nozzle bore, the tip being provided with radially disposed gas-supply ducts that communicate with the cavity.

11. In a gas stove having a header in communication with a series of cock-controlled burners, and a flash igniter therefor having a valve-controlled feed-pipe in communication with the header; the combination of a universal bar in connection with the feed-pipe valve, the bar being extended horizontally of the bank of the burner cocks, and a series of tappets carried by said bar, each being juxtaposed to a burner-controlling cock.

12. A flash-igniter comprising a torch-head having a crown tip provided with radial ducts grouped to form a single pilot-light, a feed-pipe for the torch-head, a valve therefor having a by-pass for supplying a constant flow of gas to said torch-head to form a pilot-light, and a dome provided with firing ports in radial alinement with the tip apertures.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee in the county of Milwaukee and State of Wisconsin in the presence of two witnesses.

ARNOLD O. RUTZ.

Witnesses:

GEO. W. YOUNG,

M. E. DOWNEY.

E. C. KAHN.

HOOD FOR FLASH IGNITERS.

APPLICATION FILED MAR. 3, 1915.

1,175,527. Patented Mar. 14, 1916.

Fig. 1.

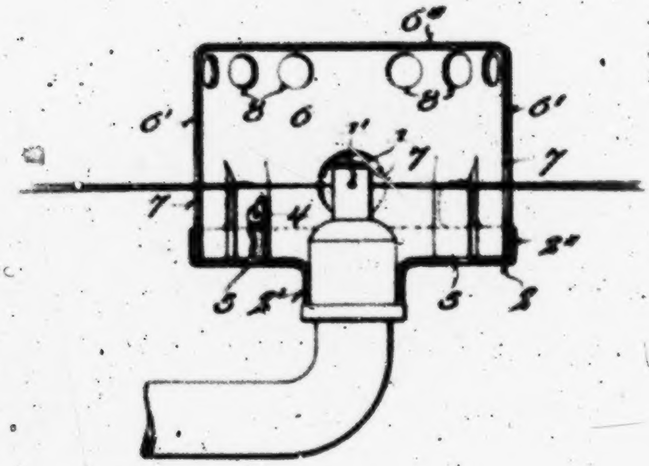


Fig. 2.

Fig. 3.

Inventor:

Witnesses:

Edward C. Kahn

May Downey

by

Attorneys.

UNITED STATES PATENT OFFICE.

EDWARD C. KAHN, OF MILWAUKEE, WISCONSIN.

HOOD FOR FLASH-IGNITERS.

1,175,527. Specification of Letters Patent. Patented Mar. 14, 1916.

Application filed March 3, 1915. Serial No. 11,919.

To all whom it may concern:

Be it known that I, EDWARD C. KAHN, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Hoods for Flash-Igniters; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention refers to the general type of hooded flash torch utilized for igniting grouped gas stove burners and has for its object to provide a simple, economical and effective hood for such flash torches.

Heretofore, so far as I am aware, the general practice has been to utilize either an open top hood for incasing the gas supply head or a closed dome hood. Practice has demonstrated that where an open top hood has been employed, cross-currents of air frequently snuff out the constantly burning pilot-light and hence the closed dome type of hood is the preferable construction. Objections have been found, however, to a dome wholly closed in the top portion for the reason that the constantly ascending current, composed of the products of combustion, is deflected downwardly by the hood into the path of the incoming fresh air, which feeds the flame, and therefore vitiates it in a manner to interfere seriously with proper combustion and at times to snuff out the pilot light altogether by exclusion of oxygen from the flame. This condition also causes the burning pilot-light to emit obnoxious odors and the partly smothered flame also causes sooty deposits, both upon the burner head and walls of the hood.

My invention is designed to overcome the above referred to objections in a closed hood and it consists essentially in the arrangement of a series of vents disposed above the usual firing ports of such hoods.

Another feature of my invention is to provide a bottom spider for the hood, whereby the same may be conveniently removed for cleansing and the separable construction also renders the device simple in manufacture and convenient in assemblage.

With the above objects in view the invention consists in certain peculiarities of construction and arrangement of parts as set forth hereinafter with reference to the accompanying drawings and subsequently claimed.

In the drawings Figure 1 represents a sectional elevation of a gas-supply head incased within a hood embodying the features of my invention, and Figs. 2 and 3, perspective views of the dismantled hood members.

Referring by characters to the drawings, 1 represents a gas-supply head provided with a series of radially disposed apertures 1′ for the discharge of a corresponding series of jet flames to associated gas stove burners, not shown. The head is supplied with gas under valve control, whereby restricted quantities of the gas are caused to flow from the apertures to form a constant burning pilot-light and when the flow of gas is increased the auxiliary volume will cause a series of jet flames to be emitted from the head, as indicated in Fig. 1 of the drawings. All of the above described mechanism, however, forms no part of my present invention.

The hood elements, which are designed to incase any type of head, comprise a spider 2 in the form of a circular disk having a central aperture therein provided with a downturned flange 2′ for engagement with the head. The rim of the spider is provided with an upturned flange 2″, from the edges of which a series of inwardly offset and upwardly projecting tongues 4 extend. The body of the disk is provided with a series of air inlet apertures 5, whereby oxygen is supplied to the head for proper combustion. Removably seated upon the spider is an inverted cup-like hood 6, the side walls 6′ of which are provided with a series of depressions 6″ extending for a predetermined distance from its mouth adapted to have sliding engagement with the tongues of the spider. The side walls of the hood are also provided with a series of firing ports 7, which are so positioned with relation to the tongue-receiving depressions as to register with the firing apertures of the head.

The side walls of the hood are also provided with a series of vent apertures 8 positioned just below the dome wall 6‴ of the hood, as shown, which vent apertures are so proportioned with relation to the air inlet apertures 5 of the spider as to produce perfect combustion with relation to the constantly burning pilot-light.

From the foregoing description it is apparent that, owing to the hood vents above the firing apertures, there is no liability for the accumulation of a strata of vitiated air or products of combustion above the burner

head to flatten or snuff out the pilot-light. This result is due to the fact that the proper amount of oxygen is admitted from below for combustion and the spent products are carried off through the vent openings 8. Furthermore, it will be seen, owing to the fact that the air intake apertures 5 and vent apertures 8 are uniformly disposed about the pilot-light, the currents of air entering and discharging from the closed hood will flow uniformly about the head, whereby cross-currents are eliminated, which cross-currents would otherwise snuff out or cause the pilot-light to waver and, as previously mentioned, this construction also eliminates the tendency of the low-burning pilot-light to foul the ports in any way, resulting in obnoxious odors.

I claim:

1. A substantially closed dome hood for flash igniters comprising an inverted one-piece cup-like member having a series of firing ports therein, and a series of vent apertures above the firing ports.

2. A substantially closed dome hood for flash igniters comprising an inverted one-piece cup-like member having a series of firing ports therein, a series of vent apertures formed in the wall of the dome above the firing ports, and a spider for supporting the inverted mouth of the cup-like hood.

3. A hood for flash igniters comprising an inverted one-piece cup-like member, the side walls of which are provided with firing ports adjacent to its inverted mouth and vent ports adjacent to its top wall.

4. In a flash torch comprising a burner head having a series of firing apertures therein; the combination of a one-piece closed dome hood for incasing the head, the hood being provided with firing ports in register with said head, and vent apertures above the firing ports.

5. In a flash torch comprising a burner head having a series of firing apertures therein; the combination of a one-piece closed top dome hood for incasing the head, the same being provided with firing ports in register with the head apertures and a series of vent apertures above the firing ports, and a spider for supporting the hood having air inlet apertures therein.

6. A one-piece closed top dome hood for flash igniters comprising an inverted cup-like member provided with a series of firing ports and vent ports above the firing ports, and a spider for detachable connection with the inverted mouth of the cup-like hood.

7. In a flash torch comprising a burner head having a series of firing apertures therein; the combination of a one-piece hood incasing the head and closed at the top, said hood having a series of vent apertures in its side walls adjacent to the top and also having firing ports located below said apertures in registry with the apertures in the head.

8. In a flash torch comprising a burner head having a series of firing apertures therein; the combination of a one-piece hood incasing the head and closed at the top, said hood having a series of vent apertures in its side walls adjacent to the top and also having firing ports located below said apertures in registry with the apertures in the head, and means for supplying air to the hood from the bottom.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee in the county of Milwaukee and State of Wisconsin in the presence of two witnesses.

EDWARD C. KAHN.

Witnesses:

GEO. W. YOUNG,

M. E. DOWNEY.

Dec. 14, 1926. 1,610,301

W. J. McCLOSKEY

TORCH

Filed May , 1925

FIG. 1

FIG. 2

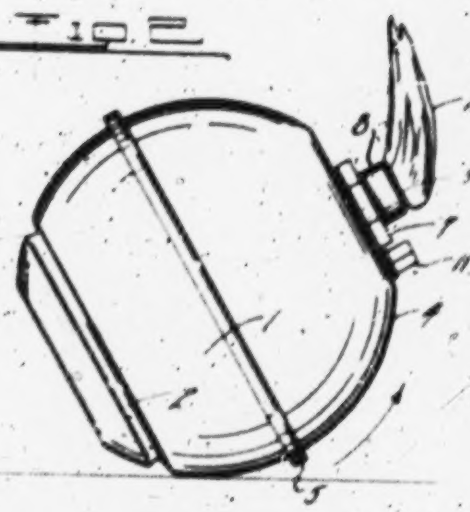
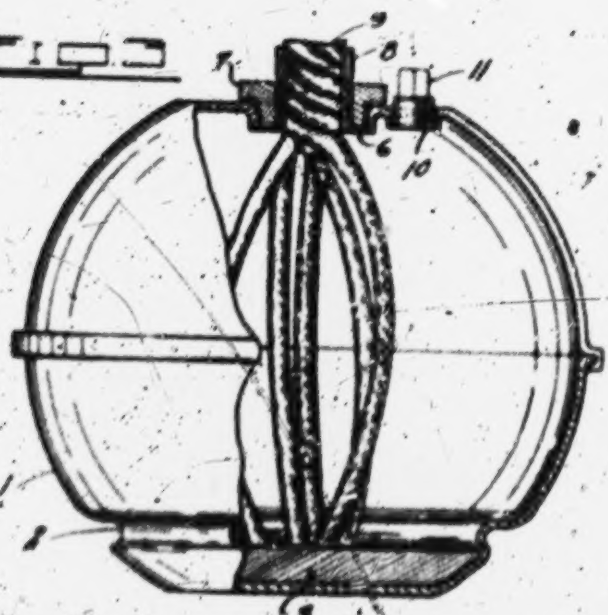


FIG. 3



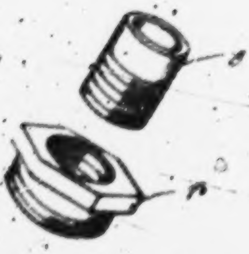


FIG. 4

FIG. 5

Wilbert J. McCloskey

INVENTOR

BY

Geo E Kirk

ATTORNEY

Patented Dec. 14, 1926. 1,610,301

UNITED STATES PATENT OFFICE.

WILBERT J. McCLOSKEY, OF TOLEDO, OHIO.

TORCH.

Application filed May 1, 1925. Serial No. 27,167.

This invention relates to jostling resistant and self righting torches.

This invention has utility when incorporated in roadway excavation marking torches as subject to disturbance by traffic.

Referring to the drawings:

Fig. 1 is a side elevation of a torch in accordance with the disclosure herein as in normal position;

Fig. 2 is a view of the torch of Fig. 1 as disturbed and about to swing toward self-righting or normal position of Fig. 1;

Fig. 3 is a view of the torch of Fig. 1, with portions broken away, the scale being enlarged;

Fig. 4 is a distributed view of the wick enveloping nipple and bushings; and

Fig. 5 is a perspective view of the loading element for the torch.

Reservoir member 1 is shown herein as of a base restricting form inwardly extending with annular re-entrant beading 2 as a holder for loading 3 herein shown as a cast plate within this sheet metal lower half of this shell of the spherical reservoir structure of this disclosure. Opposing this semicircular reservoir element 1 is spherical or dome member 4. These members 1, 4, are herein shown as united by a joint, seam, or weld 5 in the region of the maximum diameter or bulge portion of this reservoir. The dome member 4 has central inwardly threaded throat 6 which is engaged by bushing 7 having nipple 8 therein as a guide for wicking 9. Adjacent this inwardly extending threaded throat 6 is minor throat providing threaded opening 10 in which filling opening plug 11 is disposed. Upon removing the filling opening plug 11, material for combustion, as kerosene, may be introduced into this reservoir or receptacle. The wicking 9 may be worked into and through the nipple 8 to leave the desired extent of the wicking 9 protrude therefrom and then through the larger opening provided by this throat 6 of this sheet metal upper member 4, the loose wicking may be thrust and the bushing 7 assembled into locking position in the opening or throat 6.

This sheet metal unitary structure providing a vessel, is resistant against impact from horses' hoofs or vehicle wheels and when kicked, knocked, or struck will readily shift away from such source and if this be a tendency to disturb the condition of the reservoir as to its base, it normally is matter of but momentary disturbance, for the vessel at once is self-righting so that it will approximate the position or placing in the indicating or guarding of the excavation as in laying or repairing of tracks or pavement with flame 12 of the torch from the upper side of this vessel.

This vessel as made from sheet metal elements 1, 4, is of light weight and tough throughout. The walls are stiff against battering while the loading or weight 3 in the bottom of the vessel is of a mass sufficient to load the vessel for ordinarily rocking the vessel into its upright position for normal operation of the wick 9 for delivering by capillary attraction the kerosene for burning at the flame 12.

What is claimed and it is desired to secure by United States Letters Patent is:—

1. A torch reservoir housing comprising a dome shaped upper section, a complemental zone-shaped base section, and a load within said base section, whereby rocking of the torch is on a spherical bearing of the base section continuous in spherical curvature from the lateral bounding means of the base section as enveloping the load.

2. A torch reservoir housing comprising a dome shaped upper section, a complemental zone-shaped base section having an endless bead, and a rigid load element within the housing for the base section disposed inside said base section to be there retained by said bead, whereby said housing is rockably supported by said base section.

3. A torch complete in itself as to its support, said torch embodying a housing comprising a dome shaped upper portion and a complemental zone shaped base portion, which portions together form a reservoir, said housing upper portion having an opening, a wick receiving bushing in said opening, and a loaded base anchored with the lower portion and disposed within the external radius of said housing, whereby rocking of the torch toward righting position is on a continuous spherical bearing from a tilted supporting side of said housing to a position of rest with its loaded base downward and the wick bushing upward with the housing portion thereabout convex downward.

In witness whereof I affix my signature.

WILBERT J. McCLOSKEY.

Defendant's Exhibit E

Defendant's Exhibit E 1171

IN THE DISTRICT COURT OF THE UNITED STATES
FOR THE EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY,
A CORPORATION,
Plaintiff,
vs.
MONTGOMERY WARD & COMPANY,
A CORPORATION,
Defendant.

In Equity
No. E-8417

1172

Stipulation

It is hereby stipulated by and between the parties hereto by Wilber Owen, Esq., solicitor for plaintiff, and by Carl V. Wisner, Jr., Esq., solicitor for defendant, that Oscar J. Leins, a resident of the City of Milwaukee, State of Wisconsin, would, if called as a witness herein pursuant to a notice of taking testimony heretofore served herein upon January 12, 1938, testify as follows:

That his present occupation is Vice-president and General Manager of the Milwaukee Gas Specialty Company, of Milwaukee, Wisconsin; that he has been connected with that organization since 1920; that prior to his going with that company he attended the University of Wisconsin, from which he graduated with a degree of B. S. from the Department of Mechanical Engineering of that University; 1173

That he was acquainted with Arnold O. Rutz during his lifetime, and that Arnold O. Rutz died in the year 1922; that he is familiar with patent to Arnold O. Rutz, No. 1,101,146; that flash igniters

Defendant's Exhibit E

1174 which contained as a part of their structure the hood 8 disclosed in Fig. 1 of the Rutz patent, No. 1,101,146, or a hood substantially similar to that hood have been manufactured and sold by Milwaukee Gas Specialty Company from approximately the year 1914 down to the present day;

That during that period more than 15,000,000 such flash igniters have been manufactured and sold;

That the witness would further testify that he is familiar with patent No. 1,009,184, issued to Julius F. Rutz and Julius K. Luethe; that flash
1175 igniters which included as a part of their structure the bell 12 shown in Fig. 2 of the drawing of that patent have been manufactured and sold by the Rulu Company of Milwaukee, Wisconsin, during the period from approximately 1910 to approximately 1914; that no such flash igniters are now being manufactured by any company; that the Rulu Company went out of business approximately in 1914;

The witness would further testify that he is familiar with patent to Edward C. Kahn of Milwaukee, Wisconsin, No. 1,175,527; that flash
1176 igniters which included as a part of their structure the cuplike hood shown in Fig. 1 of the drawing of the patent have been manufactured by the Spitfire Company of Milwaukee, Wisconsin; that such flash igniters were manufactured for a short while prior to 1914, but that such manufacture was discontinued sometime in 1914, and that the Spitfire Company is no longer manufacturing such flash igniters;

That the witness would further testify that he is familiar with the scientific principles upon which the design of the hood 8 shown in Fig. 1 of

Defendant's Exhibit E

the patent to Arnold O. Rutz, No. 1,101,146, was 1177
based; that in the design of the structure of the hood 8 of patent No. 1,101,146 the inventor had three objects in view:

1. To protect the flame of the igniter from precipitated liquids;
2. To protect the flame of the igniter from lateral currents of air;
3. So to arrange the structure of the device that it would remain alight and be very economical in its consumption of fuel;

That the witness would further testify that from
1920 from time to time down to the present day 1178
tests for the resistance of the hood 8 to lateral currents of air and to precipitation of liquid have been made;

It is further stipulated that in connection with such testimony the defendant would offer in evidence the following United States patents as defendant's exhibits:

Arnold O. Rutz, No. 1,101,146 as Defendant's Exhibit 4;

Julius F. Rutz) No. 1,009,184 as Defendant's
Julius K. Luethe) Exhibit 25;

Edward C. Kahn, No. 1,175,527 as Defendant's 1179
Exhibit 11.

Wilber Owen,
Solicitor for Plaintiff.
Carl Wisner, Jr.,
Solicitor for Defendant.

Dated at Chicago
this 19th day of
January, 1938.

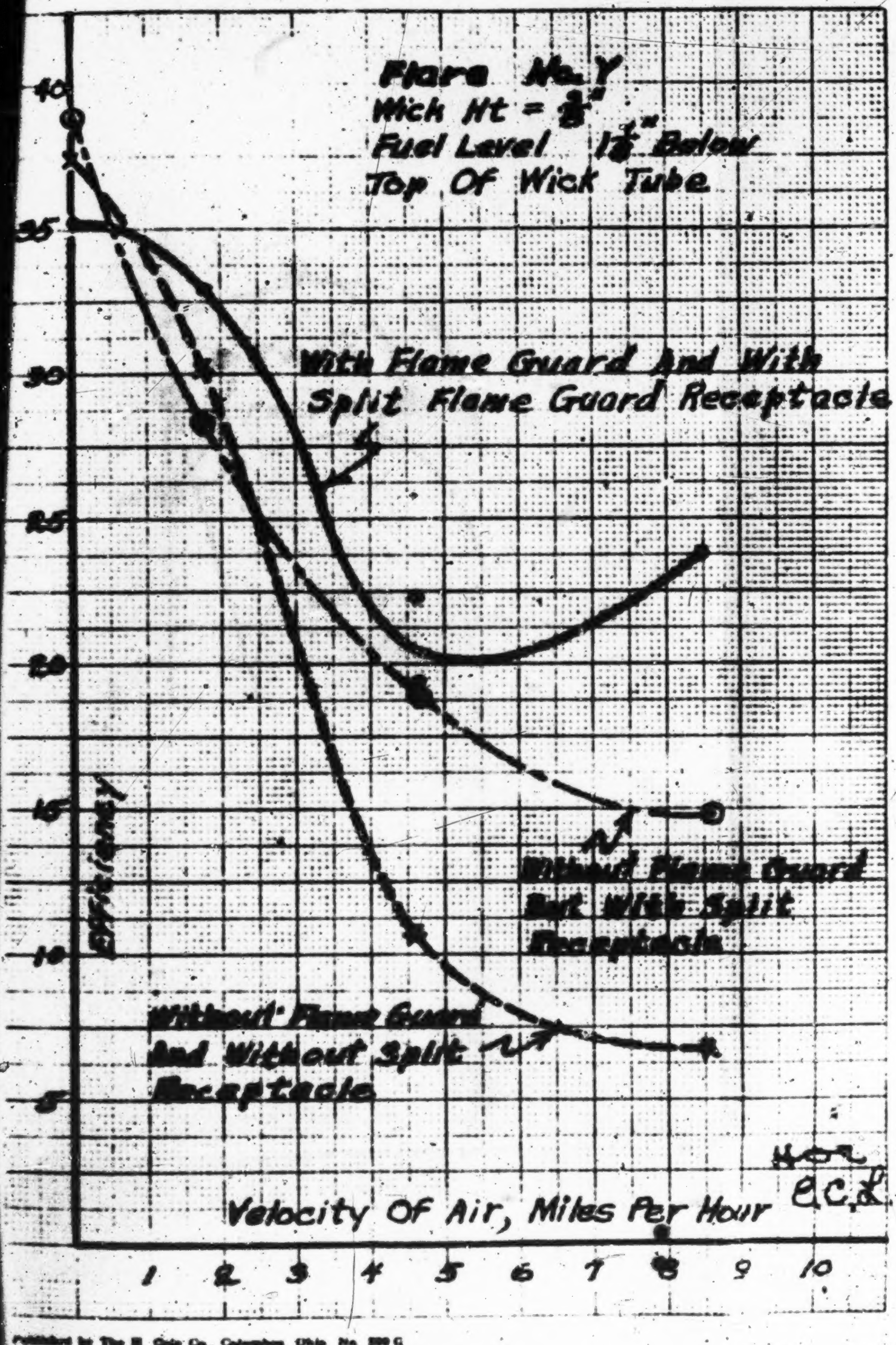

Flare No. Y
Wick Ht = 3/8"
Fuel Level 1 3/8" Below
Top Of Wick Tube
With Flame Guard And With
Split Flame Guard Receptacle
Without Flame Guard
But With Split
Receptacle
Without Flame Guard
And Without Split
Receptacle
Efficiency
Velocity Of Air, Miles Per Hour
40
35
30
25
20
15
10
5
1
2
3
4
5
6
7
8
9
10

Fig. 11

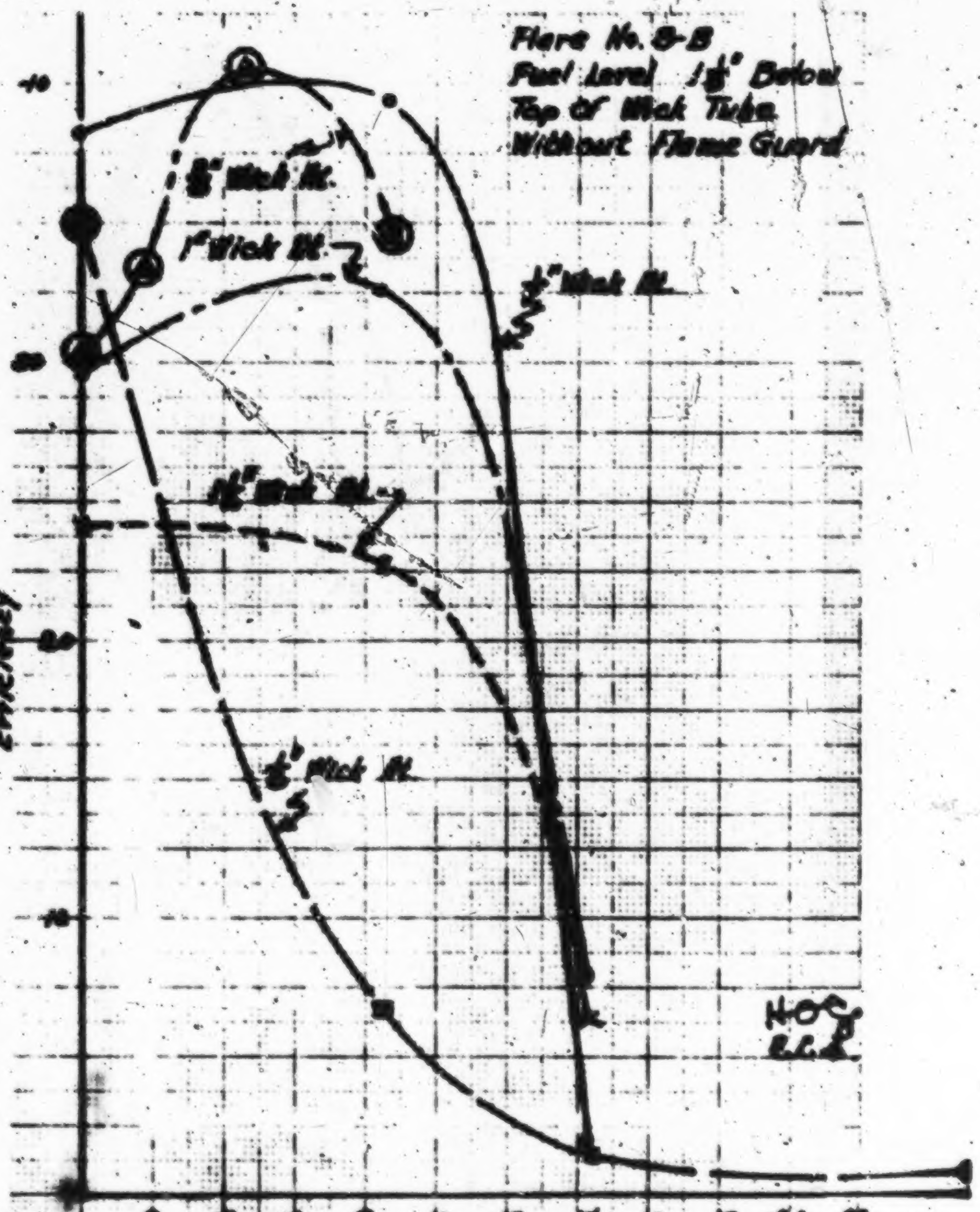

Flare No. 8-B
Fuel Level 1½" Below
Top Of Wick Tube
Without Flame Guard
⅝" Wick Ht.
1" Wick Ht.
½" Wick Ht.
1½" Wick Ht.
⅛" Wick Ht.
Efficiency
Air Velocity, Miles Per Hour
H.O.C.

Fig. 23 Ex. 35

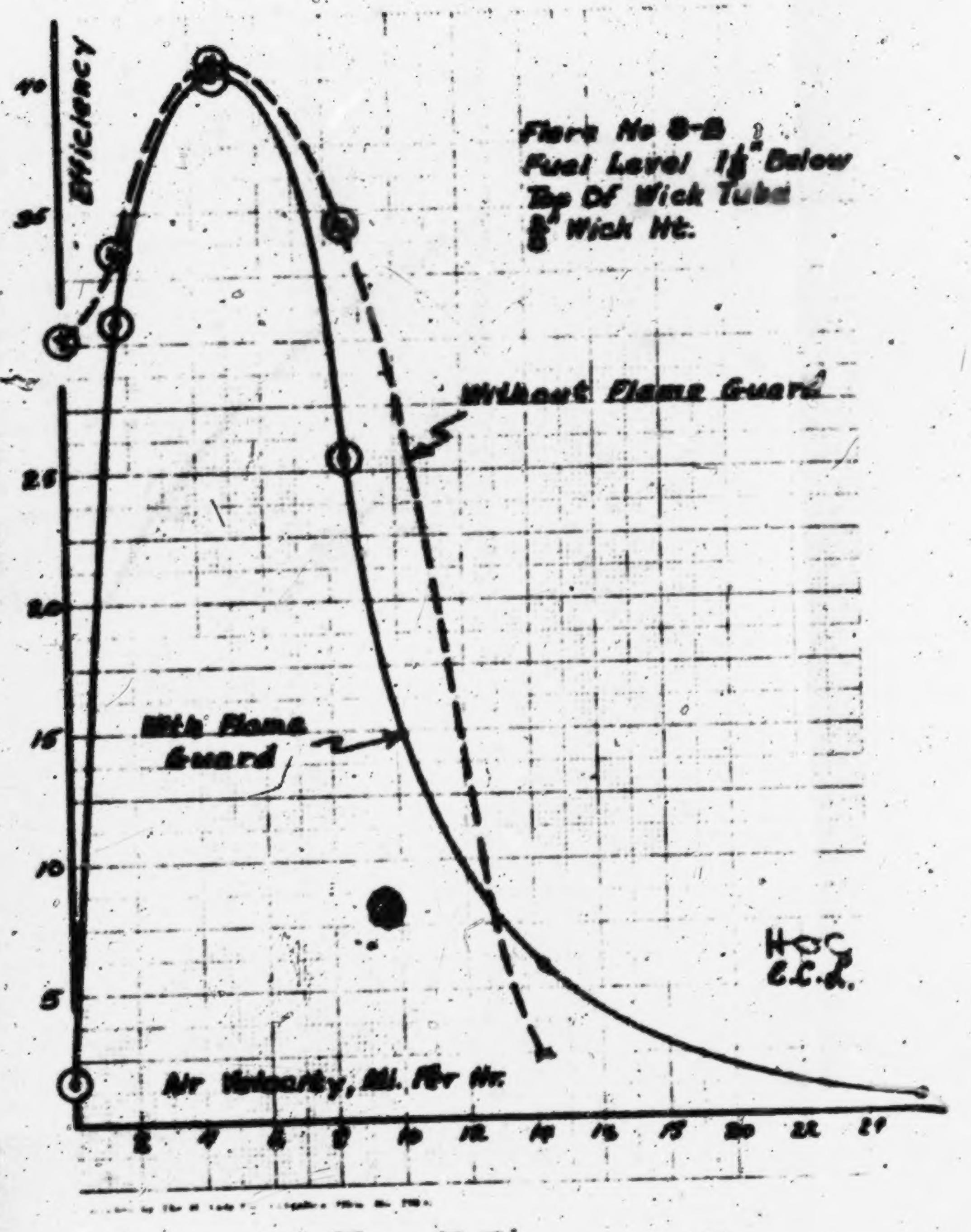

Efficiency
Flare No 8-B
Fuel Level 1½" Below
Top Of Wick Tube
⅜" Wick Ht.
Without Flame Guard
With Flame Guard
Air Velocity, Mi. Per Hr.
H.C.
C.C.L.

Fig. 75

To. ...

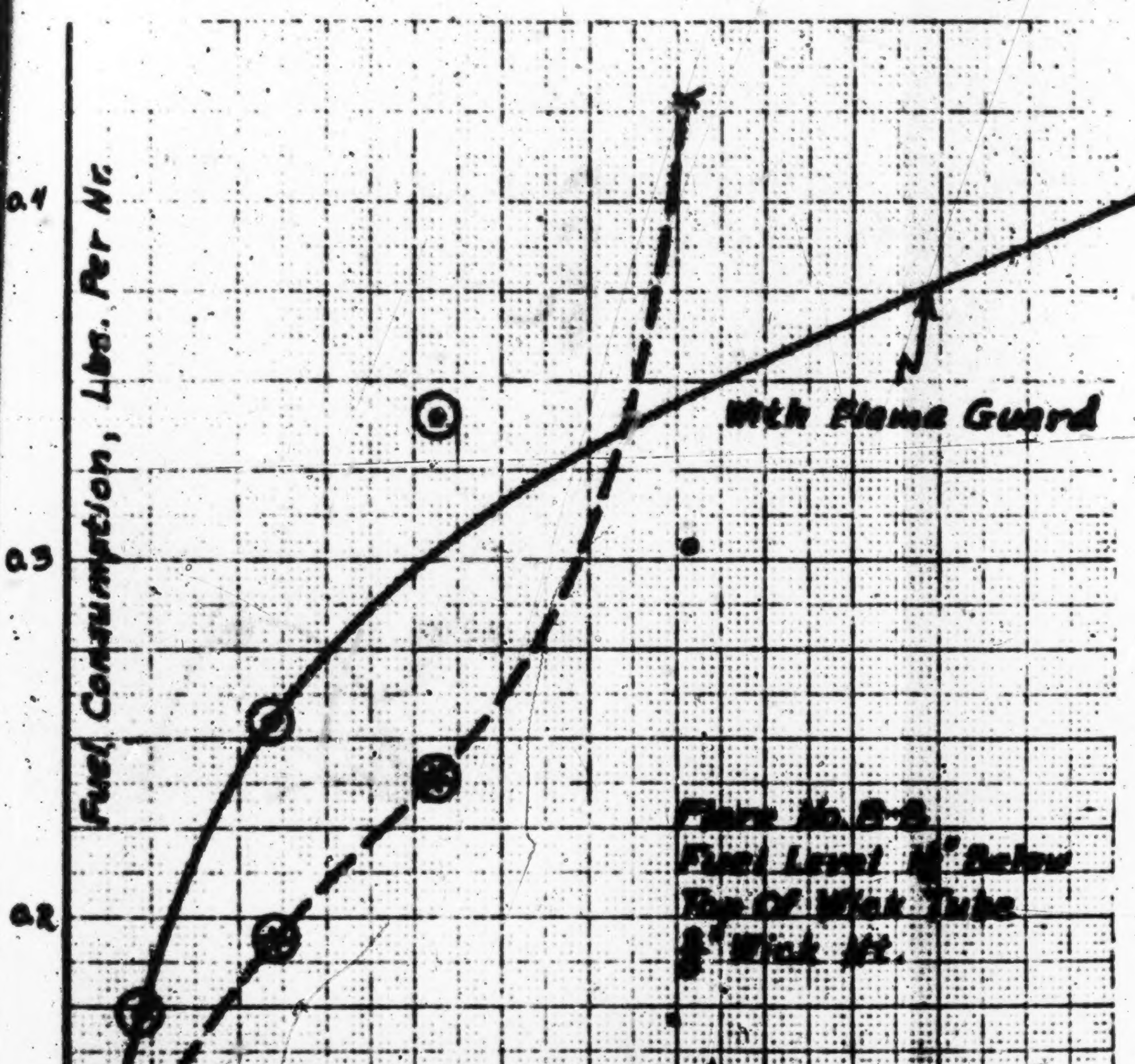
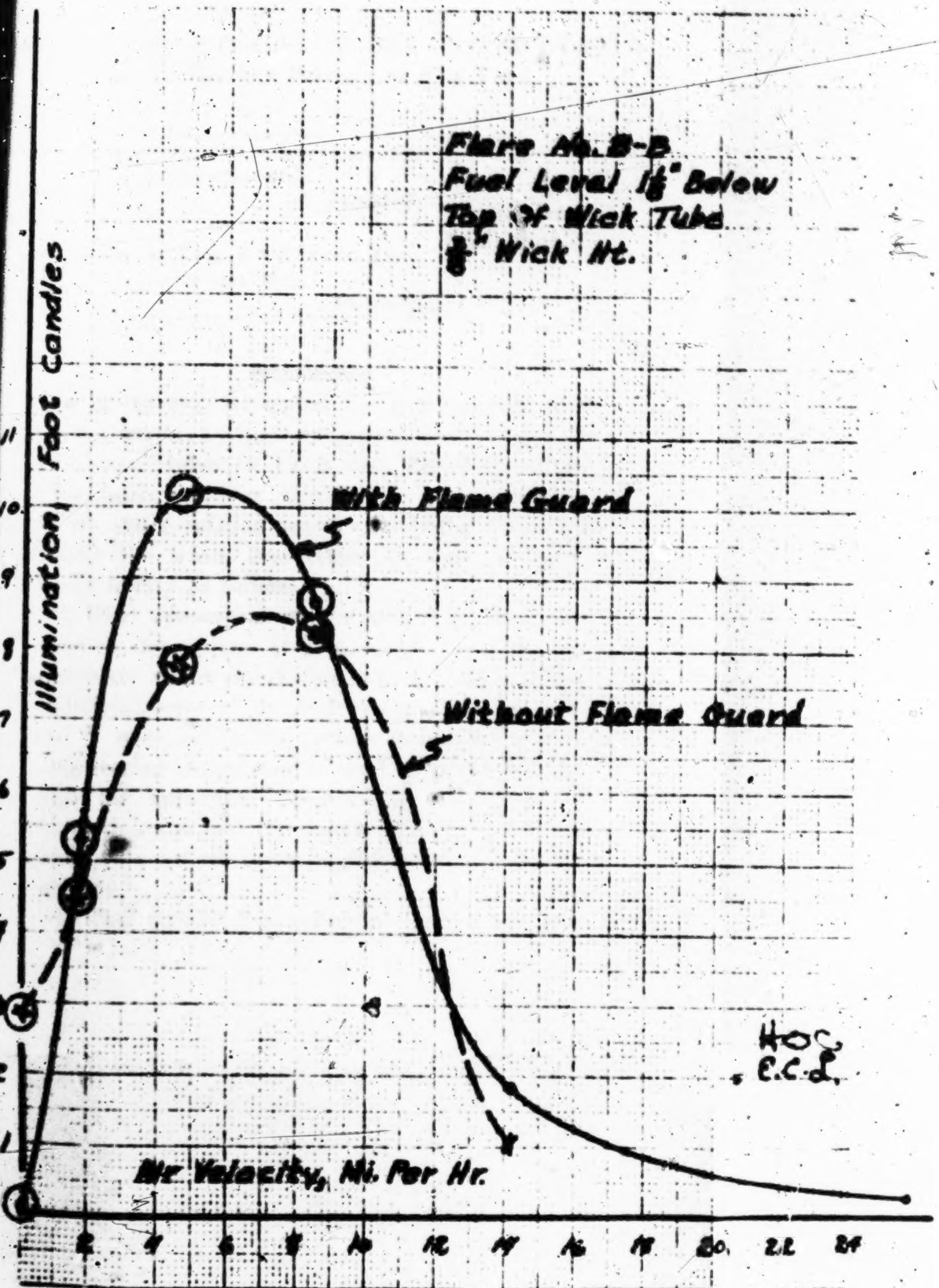

Fuel Consumption, Lbs. Per Hr.
0.1
0.2
0.3
0.4
With Flame Guard
Without Flame Guard
Fuel Level
Below
Top Of Wick Tube
Wick Ht.
Air Velocity, Mi. Per Hr.
2
12
14
16
18
20
22
24

Fig. 36



Flare No. 8-B
Fuel Level 1⅛" Below
Top Of Wick Tube
⅛" Wick Ht.
Illumination, Foot Candles
With Flame Guard
Without Flame Guard
Air Velocity, Mi. Per Hr.
1
2
3
4
5
6
7
8
9
10
11
2
4
6
8
10
12
14
16
18
20
22
24
HOC
E.C.L.

Fig. 37

Exhibit G 1213

THE DISTRICT COURT OF THE UNITED STATES
For the Eastern District of New York

The Toledo Pressed Steel Company,
a Corporation,
Plaintiff,
vs.
Montgomery Ward & Company, Inc.,
a Corporation,
Defendant.

In Equity
No. E-8417

1214

Stipulation

It is hereby stipulated by and between the parties hereto, by their respective counsel, that if Professor Huber O. Croft and Elmer C. Lundquist were called as witnesses by the defendant in the above entitled cause, upon being sworn to testify the truth, that either or both of them would testify as follows:

1. That subsequent to the taking of their respective depositions at Iowa City, Iowa, by the defendant on or about January 18, 1938, certain additional tests of the performance of flares 8-B 1215 and Y were run in the testing laboratory of the Engineering Department of the University of Iowa with the apparatus described in the aforesaid deposition and that the results of such additional tests were as set forth in Exhibit A hereto attached;

2. That Exhibit B attached hereto correctly sets forth the results of certain tests which were made by the witnesses Huber O. Croft and Elmer C. Lundquist prior to the taking of their depositions in this cause, and testified to by them in such

405

Exhibit G

1216 depositions, and truly represent the data relating to a portion of the tests of plaintiff's and defendant's flares set forth in the notebook identified by said witnesses on said depositions as Defendant's Exhibit 38, and that the graphs offered in evidence in connection with their testimony as Defendant's Exhibits 37 and 39 to 52, both inclusive, were based on the test data set forth in said Exhibit B.

3. That graphs identified as Figures 23 to 28, both inclusive, and 32 to 41, both inclusive, blueprints of which are hereto attached, are true repre-
1217 sentations in graphic form of the test data disclosed in Exhibits A and B hereto attached; that on the graphs identified as Figures 23 to 28, both inclusive, and 32 to 41, both inclusive, the points which are enclosed in a circle are taken from the original tests disclosed in Exhibit B, and the points which are not circled are taken from data disclosed in Exhibit A;

In stipulating that Messrs. Croft and Lundquist would testify as above stated, if called and sworn as witnesses in this cause, counsel for plaintiff objects to the relevancy and materiality
1218 of the foregoing stipulations and of the exhibits and graphs referred to therein. Counsel for plaintiff further reserves the right to make additional objections to this stipulation if and when the same is offered in evidence, not, however, to the qualification of the exhibits or graphs or the absence of the witnesses.

Owen & Owen,
Counsel for Plaintiff.
Wisner & Walsh,
Counsel for Defendant.

Dated this ——— day
of March, A. D. 1938.

Exhibit G

EXHIBIT A 1219

SUMMARY OF ADDITIONAL TESTS

1	2	3	4	5	6	7		
Flare	Wick Height	Fuel level	Wt. fuel burned lb./hr.	Avg. air vel. mi./hr.	Illumination in ft. candles 12″ arm	Efficiency		
1. 8-B	½	1⅛	.075	14.3	.13	1.73)		
2. 8-B	½	1⅛	.335	8.9	13.20	39.4)		
3. 8-B	½	1⅛	.113	0.0	4.32	38.2)		
4. 8-B	1	1⅛	.187	14.2	1.48	7.9)		1220
5. 8-B	1	1⅛	.285	8.6	9.20	32.3)	Without flame guard.	
6. 8-B	1	1⅛	.216	0.0	6.41	29.7)	With retainer ring.	
7. 8-B	1½	1⅛	.255	14.3	1.66	6.5)		
8. 8-B	1½	1⅛	.171	8.5	3.90	22.8)		
9. 8-B	1½	1⅛	.295	0.0	7.11	24.1)		
10. 8-B	⅛	1⅛	.518	25.7	.36	.70	Without flame guard. Without retainer ring.	
11. 8-B	⅛	1⅛	.309	25.6	.43	1.39	With flame guard.	
12. 8-B	⅛	1⅛	.267	14.2	.40	1.50	Without flame guard. Without retainer ring.	
13. 8-B	⅛	1⅛	.349	14.3	2.66	7.6	With flame guard.	
14. Y	⅛	1⅛	.043	8.6	.13	3.0	Without flame guard Without split recept.	1221
15. Y	⅛	1⅛	.085	8.5	1.24	14.6	With flame guard.	
16. Y	⅛	1⅛	.063	17.1	.60	9.5	With flame guard.	
17. 8-B	⅛	1⅛	.158	8.5	1.04	6.6	Without flame guard. Without retainer ring.	
18. 8-B	⅛	1⅛	.255	8.6	6.18	24.2	With flame guard.	
19. Y	⅛	1⅛	.031	4.5	.60	19.4)		
						)	Bare wick tube.	
20. Y	⅛	1⅛	.080	0.0	2.78	34.8)		
21. 8-B	⅛	1⅛	.108	4.94	2.41	22,3	Without flame guard. Without retainer ring.	

Exhibit G

1222	22.	8-B	⅛	1⅛	.136	4.94	3.44	25.3	With flame guard.
	23.	8-B	⅜	1⅛	.429	14.16	1.02	2.4	Without flame guar Without retainer rin
	24.	8-B	⅜	1⅛	.303	14.18	1.82	6.0	With flame guard.
	25.	8-B	⅜	1⅛	.408	25.60	.22	0.54	With flame guard.

EXHIBIT B
SUMMARY OF ORIGINAL TESTS

		1	2	3	4	5	6	7	8
1223		Flare No.	Flame Guard	Wick Ht., In.	Fuel Level In.	Wind Vel. mi./hr.	Kero. Burned lb./hr.	Illum. in Ft. Candl. 12"fromC	Eff Col. Col.
	26.	2	Yes	⅛	1⅛	0.00	.087	2.09*	24.1
	27.	2	No**	⅛	1⅛	0.00	.061	2.12*	34.8
	28.	2	Yes	¼	1⅛	0.00	.094	2.58*	27.5
	29.	2	No**	¼	1⅛	0.00	.084	2.75*	32.7
	30.	2	Yes	⅜	1⅛	0.00	.110	2.90*	26.4
	31.	2	No**	⅜	1⅛	0.00	.099	2.98*	30.2
	32.	8-B	Yes	⅛	1⅛	0.00	.037	0.047*	1.2
	33.	8-B	No	⅛	1⅛	0.00	.057	1.99*	35.0
	34.	8-B	Yes	¼	1⅛	0.00	.037	0.053*	1.4
	35.	8-B	No	¼	1⅛	0.00	.073	2.20*	30.2
	36.	8-B	Yes	⅜	1⅛	0.00	.037	0.059*	1.5
1224	37.	8-B	No	⅜	1⅛	0.00	.094	2.83*	30.2
	38.	8-B	Yes	⅜	2⅛	0.00	.035	0.053*	1.5
	39.	8-B	No	⅜	2⅛	0.00	.092	2.55*	27.7
	40.	8-B	Yes	⅜	3⅛	0.00	.034	.047*	1.3
	41.	8-B	No	⅜	3⅛	0.00	.083	2.40*	28.9
	42.	8-B	Yes	⅜	1⅛	8.51	.340	8.64	25.4
	43.	8-B	No	⅜	1⅛	8.51	.239	8.22	34.4
	44.	8-B	Yes	⅜	1⅛	4.73	.255	10.22	40.2
	45.	8-B	No	⅜	1⅛	4.63	.193	7.80	40.5
	46.	8-B	Yes	⅜	1⅛	1.77	.172	5.31	30.8
	47.	8-B	No	⅜	1⅛	1.73	.135	4.50	33.4
	48.	Y	Yes##	⅜	1⅛	0.00	.101	3.56	35.2

Exhibit G

EXHIBIT B (Continued) 1225

	1	2	3	4	5	6	7	8	
	Flare No.	Flame Guard	Wick Ht., In.	Fuel Level In.	Wind Vel. mi./hr.	Kero. Burned lb./hr.	Illum. in Ft-Candl. 12″fromC	Eff. Col. 7 Col. 6	
49.	Y	No###	⅜	1⅛	0.00	.094	3.66	38.9	
50.	Y	No#	⅜	1⅛	0.00	.122	4.56	37.4	
51.	Y	Yes##	⅜	1⅛	8.48	.201	4.78	23.8	
52.	Y	No#	⅜	1⅛	8.54	.067	0.45	6.7	
53.	Y	Yes##	⅜	1⅛	4.63	.168	3.26	19.4	
54.	Y	Yes##	⅜	1⅛	4.60	.166	3.70	22.3	
55.	Y	No#	⅜	1⅛	4.60	.068	0.73	10.7	1226
56.	Y	Yes##	⅜	1⅛	1.72	.192	6.35	33.0	
57.	Y	No#	⅜	1⅛	1.73	.126	3.80	30.2	
58.	2	Yes	⅜	1⅛	0.00	.113	3.28	29.1	
59.	2	No**	⅜	1⅛	0.00	.120	3.82	31.8	

* 7.5 inch arm used but corrected to 12 inches by the "inverse square" law.

** Without flame guard but with regular flame guard receptacle.

Without flame guard and without split flame guard receptacle.

With flame guard and with split flame guard receptacle. 1227

Without flame guard but with split flame guard receptacle.

1228 **Defendant's Exhibit K**

March 9, 1938

COMPARISON OF PERFORMANCE OF PLAINTIFF'S FLARE WITH AND WITHOUT FLAME GUARD

	Item No.	Flame Guard	Wick Exten-sion	Air Velocity m.p.h,	Fuel Burned lbs./hr.	Mean Candle Power	Effi-ciency
	1	Yes	3/8"	0.00	0.037	0.059	1.59
	2	No	3/8"	0.00	0.094	2.83	30.2
1229	3	Yes	3/8"	1.77	0.172	5.31	30.8
	4	No	3/8"	1.73	0.135	4.50	33.4
	5	Yes	3/8"	4.73	0.255	10.22	40.2
	6	No	3/8"	4.63	0.193	7.80	40.5
	7	Yes	3/8"	8.51	0.340	8.64	25.4
	8	No.	3/8"	8.51	0.239	8.22	34.4
	9	Yes	3/8"	14.18	0.303	1.82	6.0
	10	No	3/8"	14.16	0.429	1.02	2.4
	11	Yes	1/8"	0.00	0.037	0.047	1.27
	12	No	1/8"	0.00	0.057	1.99	35.0
	13	Yes	1/8"	4.94	0.136	3.44	25.3
	14	No	1/8"	4.94	0.108	2.41	22.3
1230	15	Yes	1/8"	8.60	0.255	6.18	24.2
	16	No	1/8"	8.50	0.158	1.04	6.6
	17	Yes	1/8"	14.30	0.349	2.66	7.6
	18	No	1/8"	14.20	0.267	0.40	1.50
	19	Yes	1/8"	25.60	0.309	0.43	1.39
	20	No	1/8"	25.70	0.518	0.36	0.70

Averages

21	Average efficiency, 3/8" wick, with flame guard	20.79
22	Average efficiency, 3/8" wick, without flame guard	28.18
23	Average efficiency, 1/8" wick, with flame guard	11.95
24	Average efficiency, 1/8" wick, without flame guard	13.22
25	Average efficiency with flame guard	16.375
26	Average efficiency without flame guard	20.70

Defendant's Exhibit K

COMPARISON OF PERFORMANCE OF PLAINTIFF'S UNPROTECTED FLARE AT VARIOUS WICK HEIGHTS 1231

Item No.	Wick Extension	Air Velocity m.p.m.	Fuel Burned lbs./hr.	Mean Candle Power	Efficiency	
1	⅛″	0.00	0.057	1.99	35.0	
2	⅛″	8.50	0.158	1.04	6.6	
3	⅛″	1420	0.267	0.40	1.5	
4	½″	0.00	0.113	4.32	38.2	
5	½″	8.90	0.335	13.20	39.4	
6	½″	14.30	0.075	0.13	1.73	1232
7	1″	0.00	0.216	6.41	29.7	
8	1″	8.60	0.285	9.20	32.3	
9	1″	14.20	0.187	1.48	7.90	
10	1½″	0.00	0.295	7.11	24.1	
11	1½″	8.50	0.171	3.90	22.8	
12	1½″	14.30	0.255	1.66	6.50	

Averages

13	Average efficiency, ⅛″ wick extension	14.33
14	Average efficiency, ½″ wick extension	26.44
15	Average efficiency, 1″ wick extension	23.30
16	Average efficiency, 1½″ wick extension	21.13 1233

Defendant's Exhibit K

1234 COMPARISON OF PERFORMANCE OF PLAINTIFF'S AND DEFENDANT'S FLARES

	Kerosene Burned lb./hr.	Mean Candle-power	Efficiency Candle-power Kero-sene/hr.
No wind: ⅛″ wick			
Anthes	0.087	2.09	24.1
Toledo	0.037	0.047	1.27
No wind; ¼″ wick			
Anthes	0.094	2.58	27.5
1235 Toledo	0.037	0.053	1.43
No wind; ⅜″ wick			
Anthes	0.110	2.90	26.4
Anthes	0.113	3.28	29.1
Toledo	0.037	0.059	1.59
Wind 1.77 m.p.h.; ⅜″ wick			
Anthes	0.192	6.35	33.0
Toledo	0.172	5.31	30.8
Wind 4.65 m.p.h.; ⅜″ wick			
Anthes	0.168	3.26	19.4
Anthes	0.166	3.70	22.3
Toledo	0.255	10.22	40.2
1236 Wind 8.5 m.p.h.; ⅜″ wick			
Anthes	0.201	4.78	23.8
Toledo	0.34	8.64	25.4

Defendant's Exhibit M 1237

March 10, 1938

STATE OF NEBRASKA, COUNTY OF LANCASTER, *ss.*

I, R. L. Cochran, do hereby certify that I am Governor of the State of Nebraska, and that Mr. R. E. Bollen is the duly appointed Assistant Testing Engineer with the Department of Roads and Irrigation, Motor Vehicle Division, State of Nebraska.

I further certify that Mr. R. R. Horrocks is the
duly appointed statistician with the Motor Vehicle
Division, Department of Roads and Irrigation, 1238
State of Nebraska, and as such statistician has in
his charge and is keeper of records of testing made
by the Department, of motor vehicle equipment and
of certificates of approval by said Department to
any such equipment.

I further certify that Richard C. Hunter is the Attorney General duly elected for the State of Nebraska.

I further certify that the above named R. E.
Bollen and R. R. Horrocks are the proper officers
to certify to records of testing made by the De-
partment of Roads and Irrigation, and that the at- 1239
tached attestations by them are in due form.

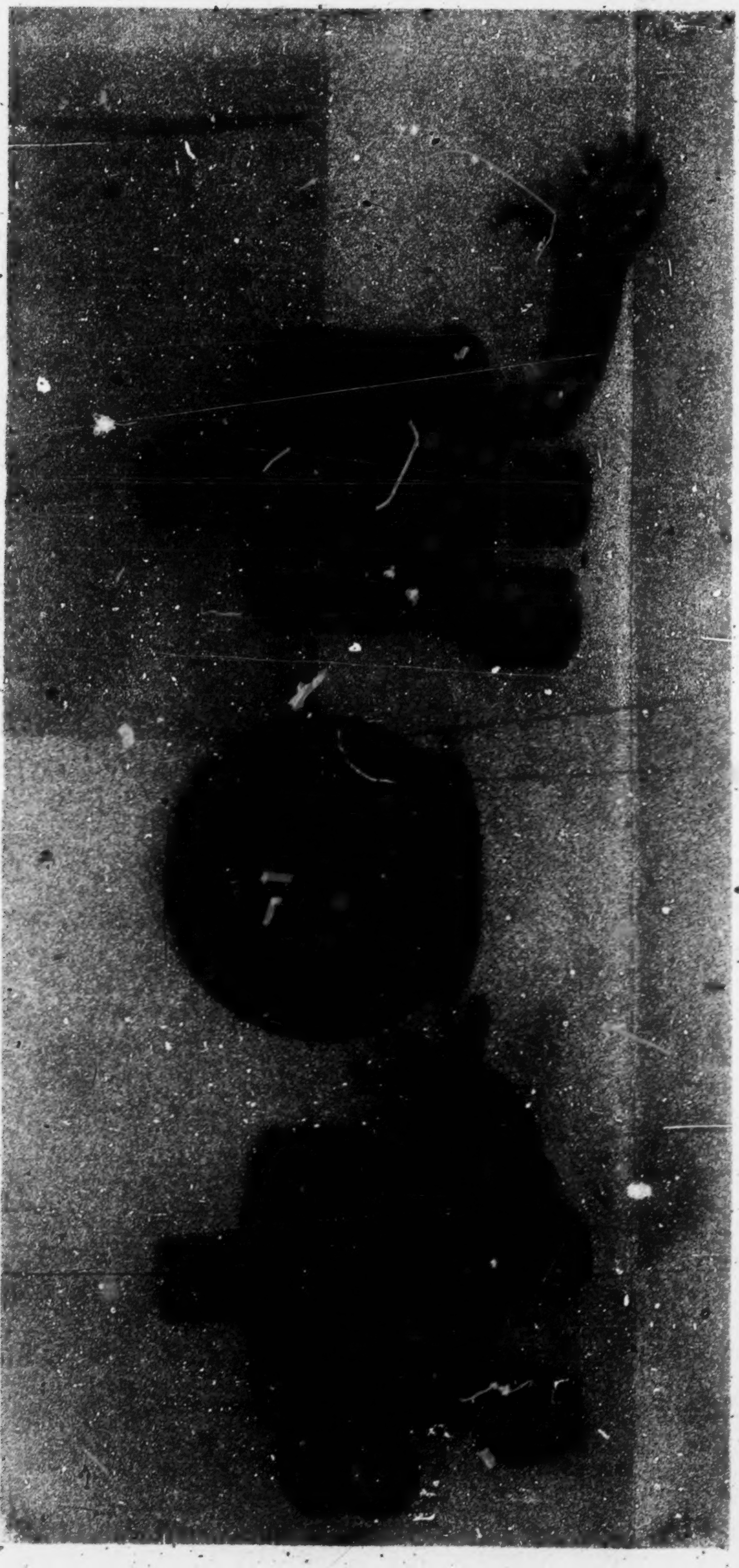
Witness my hand and seal this 31st day of Jan., 1938.

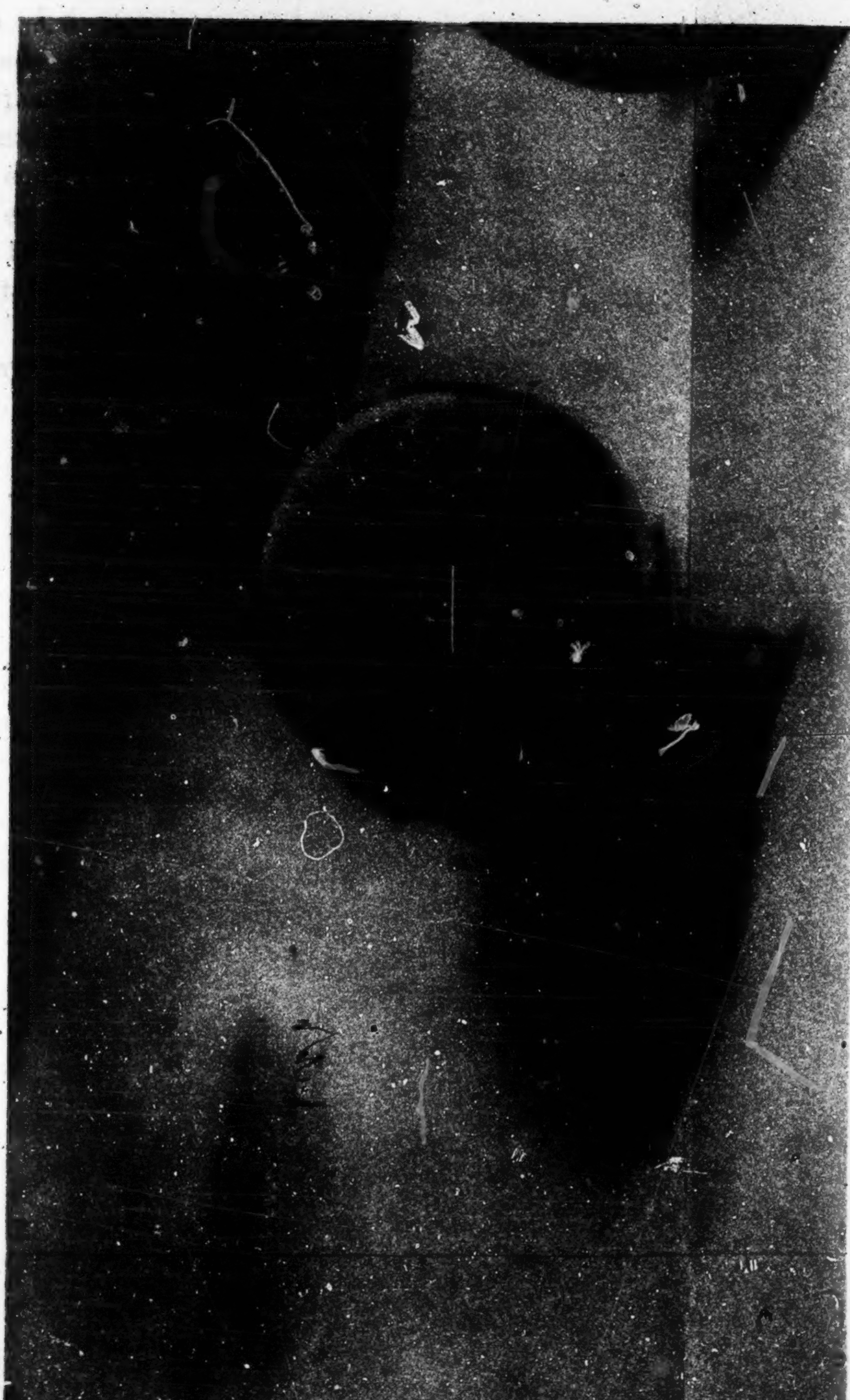
R. L. COCHRAN,
Governor.

(Seal)

HARRY R. SWANSON,
Secretary of State,
By DONALD E. DEVRIES,
Deputy Secretary of State.

(Seal)





Defendant's Exhibit M

STATE OF NEBRASKA, COUNTY OF LANCASTER, *ss.* 1252

I, Richard C. Hunter, do hereby certify that I am the Attorney General duly elected for the State of Nebraska. I do further certify that the Department of Roads and Irrigation receives in its custody for purposes of conducting experimental tests, road equipment and motor vehicle equipment. When such equipment is received for testing, the samples of equipment tested are retained by the Department for convenience and cannot thereafter be releasd to any person, the manufacturer or otherwise.

Witness my hand and seal this 2nd day of February, 1938. 1253

RICHARD C. HUNTER,
Attorney General.

1254

Defendant's Exhibit M

STATE OF NEBRASKA 1255

No. 21

DEPARTMENT OF ROADS AND IRRIGATION

MOTOR VEHICLE DIVISION

CERTIFICATE APPROVING WARNING DEVICES

THIS CERTIFIES: that the Trukflar—Type PTR manufactured by the Anthes Force Oiler Co., Fort Madison, Iowa, having been duly tested in accordance with Senate File Number 32 of the 1935 Session of the Legislature, approved May 13th, 1935, and with the requirements and specifications 1256
adopted by the State Department of Roads and Irrigation, and found to comply with the provisions of the same, is hereby approved by the State Engineer of the State of Nebraska to be used for motor vehicle equipment within the State, subject to the regulations, as set forth in this act:

Remarks: Identification: (TRUKFLAR) Painted on side of flare. (Anthes Force Oiler Co., Fort Madison, Iowa, Type PTR) Stamped in metal in bottom of flare.

Witness my hand and the Seal of the State Department of Roads and Irrigation at the City of 1257
Lincoln, this 26th day of October, 1937.

A. C. TILLEY, (signed)
State Engineer,

(Seal) By R. W. GULWELL. (signed)

Defendant's Exhibit M

1258 CERTIFICATE OF
DEPARTMENT OF ROADS AND IRRIGATION
MOTOR VEHICLE DIVISION
STATE OF NEBRASKA

State of Nebraska, County of Lancaster, *ss.*

I, R. R. Horrocks, do hereby certify that the attached Certificate of Approval of oil burning signal flare is a true and correct copy of Certificate of Approval covering Trukflar—PTR contained in the records of the Department of Roads and Irrigation, Motor Vehicle Division, State of Nebraska,
1259 and that said records including the original certificate together with reports of tests are in my possession and under my care and supervision in the State Capitol Building, Lincoln, Nebraska.

Witness my hand and the seal of the State Department of Roads and Irrigation at the City of Lincoln, Nebraska, this 31st day of Jan., 1938.

R. R. Horrocks,

(Seal) Statistician, Motor Vehicle Division.

1260

Defendant's Exhibit M

STATE OF NEBRASKA 1261

Department of Roads and Irrigation
Bureau of Roads and Bridges

TESTING LABORATORY

Department of Engineering Mechanics,
University of Nebraska

REPORT OF TEST OF OIL BURNING SIGNAL FLARE

1262

Date Received: September 30, 1937
Date Tested: October 9, 1937

Report No. 47
Lab. Ident. No. 116 a, b, c.
Manufacturer: Anthes Force Oiler Co. Address: Fort Madison, Iowa.
Model or Type: TRUKFLAR—Type PTR
Identification: (TRUKFLAR) Painted on side of flare. (Anthes Force Oiler Co., Fort Madison, Iowa, Type PTR) Stamped in metal in bottom of flare.
Type of Container: Red Colored Metal Box (6⅛"x6⅛"x18⅛") 1263
Fuel Capacity of Flare: 1350 cc. to fill up to Fuel Level Mark on flare.
Overall Height of Flare: 6"
Size of Wick: ¾"x8" (16 strands of soft material, Red covering, Black marker)
Wick adjustment: 3/16" above wick tube.
Average Burning Time: 10 hours.
Maximum air velocity in which flares will burn: 32 miles per hour.

Defendant's Exhibit M

1264 Sprinkler (Rain) Test: Burns satisfactory in $1\frac{3}{4}''$ per hr. rain, steady rate.

Visibility: Satisfactory at 500 feet.

Leakage (in container): None—very satisfactory.

Construction: Satisfactory.

General Comments: Instructions for wick adjustment, fuel height and method of carrying flare printed on a tag attached to each flare.

Recommended for approval

C. M. Duff,
Testing Engineer

R. E. Bollen, (signed)

1265 Assistant Testing Engineer

10/14/37 fs 8

CERTIFICATE OF
DEPARTMENT OF ROADS AND IRRIGATION
MOTOR VEHICLE DIVISION
STATE OF NEBRASKA

State of Nebraska, County of Lancaster, *ss.*

I, R. E. Bollan, do hereby certify that the attached report of test of oil burning signal flare is a true and correct copy of the report of test made
1266 under my supervision and contained in the records of the Department of Roads and Irrigation, Motor Vehicle Division, State of Nebraska, that the attached photographs were taken in our laboratories January 28, 1938, and correctly and truly portray the details of construction and appearance of the truck flares covered by the foregoing test; that the truck flares tested are in the possession of the Department and cannot be released from its custody.

Witness my hand and the seal of the State Department of Roads and Irrigation at the City

Defendant's Exhibit M

of Lincoln, Nebraska, this 31st day of January, 1267
1938.

R. E. Bollan,
Assisting Testing Engineer.

State of Nebraska, County of Lancaster, *ss.*

I, R. R. Horrocks, do hereby certify that the attached report of test of oil burning signal flare is a true and correct copy of the report of test contained in the records of the Department of Roads and Irrigation, Motor Vehicle Division, State of Nebraska, and that these records are in my possession and under my care and supervision. I 1268
do further certify that the attached photographs were taken in our laboratories January 28, 1938, and correctly and truly portray the details of construction and appearance of the truck flares covered by the foregoing test; that the truck flares tested are in the possession of the Department and cannot be released from its custody.

Witness my hand and the seal of the State Department of Roads and Irrigation at the City of Lincoln, Nebraska, this 31st day of January, 1938.

R. R. Horrocks, 1269
Statistician, Motor Vehicle Division.

(Seal)

1270 NOTE.—The opinion of the Sixth Circuit Court of Appeals in *Standard Parts, Inc., vs. Toledo Pressed Steel Co.* is reported at page 336 of 93 Fed. (2).

IN THE UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY, A CORPORATION, *Plaintiff*, *vs.* MONTGOMERY WARD & CO., INC., *Defendant.*	Equity No. 8417

1271

Opinion of Moscowitz, J.
(Filed April 11, 1938)

DARBY & DARBY, Solicitors for Plaintiff. SAMUEL E. DARBY, JR., WILBER OWEN, Of Counsel.

ANTHONY WILLIAM DELLER, Solicitor for Defendant. CARL V. WISNER, JR., Of Counsel.

MOSCOWITZ, D. J.

1272 This is the usual patent suit for the alleged infringement of patent No. 1,732,708 issued to J. E. Withrow and L. W. Close on October 22, 1929. This patent was issued to plaintiff, The Toledo Pressed Steel Company, a corporation, as assignee, and relates to outdoor torches which are used as warning signals on public highways.

The objects of the invention, as stated in the patent, are:

> "This invention relates to street torches, such as are commonly used for illuminating road obstructions, and usually referred to as construction torches, but more particularly to devices for

increasing the efficiency of such torches and militating against extinguishment of the torch flame, and an object is to provide a simple and efficient attachment for torches of the above character for increasing the efficiency thereof and materially reducing the liability of extinguishment of the flame by high winds. Another object is to provide a burner so constructed and arranged that liability of extinguishment of the flame by high winds or by rain is reduced to a minimum. Further objects are to provide a device of the above character which may be inexpensively manufactured and has the new and improved features of construction hereinafter described." 1273

Plaintiff claims infringement of claims 2, 5, 11, and 12 of the patent to J. E. Withrow and L. W. Close, No. 1,732,708. Claims 2, 5, 11, and 12 read as follows: 1274

"2. In a device of the class described, a torch body having an opening for a wick, and a flame guard for said wick mounted on the outside of said torch body, said guard including a cap provided with an imperforate top wall and lateral flame openings adapted to emit a luminescent flame, and air ports."

"5. In a devise of the class described, a construction torch having an opening in its upper end for a wick, means to hold the wick in place, and a guard fitting over the outer end of the wick 1275
but spaced from the sides thereof, said guard having an imperforate top wall and side flame and air openings."

"11. A burner for a construction torch adapted to emit a luminescent flame and comprising a wick holder having a portion in contact with the wick and a supporting and heat-receiving flange, and means enclosing a space above said flange and surrounding the wick, except for provision for lateral exit of flame and restricted entrance of air for combustion."

"12. A burner for a construction torch adapted to emit a luminescent flame and comprising a wick holder having a portion in contact with the wick and a lateral flange, and a cap en-

1276 closing and spaced from the end of the wick and having an imperforate top and provision for lateral exit of flame and entrance of air, and the bottom of the cap being in heat conducting relation to said flange."

The suit is against Montgomery Ward & Co., Inc., and is defended by Anthes Force Oiler Company, manufacturer of the alleged infringing device.

This patent was held invalid by the Circuit Court of Appeals for the Sixth Circuit in Standard Parts, Inc., vs. Toledo Pressed Steel Co., 93 F. (2d) 336.
1277 The testimony here is substantially the same as the testimony before the court in Standard Parts, Inc., vs. Toledo Pressed Steel Co., supra. No good purpose will be served by a further discussion of the patent in view of the fact that I am in agreement with the conclusions reached in Standard Parts, Inc., vs. Toledo Pressed Steel Co., supra. The Circuit Court in that case decided:

"The bomb-shaped excavation torch, weighted against upsetting, with flattened bottom and a wick receiving opening in its top, was already old when this court in the light of prior art denied validity to McCloskey patent 1,600,301, in 1929.
1278 McCloskey vs. Toledo Pressed Steel Co., 6 Cir., 30 Fd. 2d 12. The appellee had, however, built up a substantial business in the open flame bomb-shaped torches of the McCloskey type before the present patent was granted. Although it claimed for such torches capacity to burn in all kinds of weather, it now says that numerous complaints of their extinguishment by wind and rain led the present patentees to the long series of experiments and tests extending over a number of years which resulted in the burner and guard which is the subject matter of the patent in suit, that the device has successfully met the requirements of contractors and State Highway Commissions, has sold in large volume, has been the

subject of license to several manufacturers, and 1279
has been copied without license by the manufacturer defending the present suits.

"We see no patentable distinction in the many claims in suit, however, they may be differentiated from each other, were the issue solely one of infringement. The elements of claim 1, which relate to the guard or cap, require that it be disposed on the outer side of the torch body to enclose the outer end of the wick, that it have an imperforate upper wall, lateral flame openings, and air openings below the flame openings. Other claims variously describe these cap elements. Claim 2 recites the flame openings as adapted to emit luminescent flame, and designates the cap
as a flame guard for the wick. Others speak of 1280
an outwardly extending flange in the region of the wick opening to which the cap is connected, and still others as having the bottom of the cap in heat conducting relation to the flange, or in heat transferring relation to the flange.

"Stripped of variations in nomenclature, and the ingeniously differentiated phrases of counsel in setting forth the claims, the invention is for a burner with a metal guard to protect the flame from air currents and rain. The art is full of illustration and description of metal guards for burners, typical of which are the patents to Almond, No. 193,796; Blake, No. 453,335; Kahn, No. 1,755,527; Heston, No. 270,587, and Hath-
away, No. 147,496. The challenge to their perti- 1281
nence must be repelled. There is sufficient suggestion in a burner guard when it is found in one familiar contrivance to point the way to its use in another. We have often observed that where an art is a specialized development of an older art the offspring is entitled to the previously disclosed useful characteristics of the ancestral estate. Dunham Co. vs. Cobb, 6 Cir., 19 F. 2d 328; Page Steel & Wire Co. vs. Smith Bros. Hardware Co., 6 Cir., 64 F. 2d 512. A mere change in environment is not patentable unless invention may be found in the concept of the adaptation. Willett Mfg. Co. vs. Root Spring Scraper Co., 6 Cir., 55 F. 2d 858. In Lakewood Engineering Co. vs. Walker, 6 Cir., 23 F. 2d 623,

1282 invention was found in the adaptation of an element from a wholly unrelated art where differences in size, weight, strength, purpose, and manner of use were such that no effective suggestion could have been furnished by the old device. Even there the question was recognized as close, and we have indicated that beyond that we ought not to go. Page Steel & Wire Co. vs. Smith Bros. Hardware Co., supra.

"Once again support for validity is sought in demonstration of commercial success. We have seen that the plaintiff was already a successful manufacturer of open flame flares and torches before the alleged invention was made, extensively advertised as possessing the identical vir-
1283 tues of the device of the patent. Acceptance of licenses where royalty is relatively insignificant does not of itself establish patent validity, Firestone Tire & Rubber Co. vs. United States Rubber Co., 6 Cir., 79 F. 2d 948, since as against strong manufacturers competitors frequently find it more expedient to yield to the claims of a doubtful patent than to undertake the expense and trouble of patent litigation. There is here no substantial evidence of effort general to the industry to solve a problem which long defied it. The proof is limited to experiments of the patentees, and so far as it goes it serves to demonstrate lack of awareness of the teachings of the art rather than the inherent difficulties of the
1284 problem itself. They chose the long road to solution, and the patent law does not reward mere persistence, unassociated with original creative effort.

"Decrees reversed. Causes remanded, with instructions to dismiss the bills for want of invention."

It was old in the art to provide a metal guard to protect the flame from wind and rain. These accomplishments are shown in the patents to Rutz and Malcov. During the many centuries flames have been protected from winds and rains. It was not new to provide a metal covering, in which there were holes, to protect a flame.

I adopt the following findings of fact and con- 1285
clusions of law submitted by the defendant:

FINDINGS OF FACT

1. This suit involves the questions of validity and infringement of Claims 2, 5, 11, and 12 of patent to Withrow et al. No. 1,732,708, property of the plaintiff.

2. That Claims 2, 5, 11, and 12 of patent to Withrow et al. No. 1,732,708 are void for want of novelty.

3. That torch bodies were well known and in 1286
public use for more than two years prior to December 26, 1928, the filing date of the application for the patent in suit.

4. That metal guards for the protection of flames were well known and in public use for more than two years before December 26, 1928, and that such a guard is shown in patent to Rutz, No. 1,101,146 of June 23, 1914.

5. That devices for maintaining the heat of a wick holder and wick to facilitate the vaporization of the fuel were well known and in public use for
more than two years before December 26, 1928, an 1287
example of such a device being shown in Russian patent to Malcov No. 1163 of the year 1868.

6. That Claims 2, 5, 11, and 12 of patent to Withrow et al. No. 1,732,708 are aggregative in view of the McCloskey torch body (Plaintiff's Exhibit 27) and the flame guard manufactured by the Milwaukee Gas Specialty Company and exemplified by the hood 8 of patent to Rutz No. 1,101,146 of June 23, 1914, and shown in Defendant's Exhibit L, and it would only be an act of mechanical skill to apply the Rutz flame guard to a torch body

1288 for the purpose of protecting the wick and flame thereof from wind and rain, or to devise means for maintaining the heat of the wick holder and wick.

7. That defendant is using a flame guard shown in Plaintiff's Exhibits 3, 25 and 26, similar to the flame guard manufactured by the Milwaukee Gas Specialty Company and shown in Defendant's Exhibit L, except as to the size of the flame ports, and the court finds that the difference in size between the flame ports of defendant's structure and of the Rutz flame guard is immaterial.

8. That the flame guard manufactured by the
1289 Milwaukee Gas Specialty Company, and shown in Defendant's Exhibit L, may be employed without change for the purposes of the patent in suit, and that a torch with such a flame guard, similar to Defendant's Exhibit L, has been qualified for use as a highway flare by the Department of Roads and Irrigation, Motor Vehicle Division, State of Nebraska, as shown by Defendant's Exhibit M.

9. Defendant is entitled to a decree.

CONCLUSIONS OF LAW

1290 1. Defendant is entitled to a decree dismissing the bill for want of equity, and finding that the patent in suit is void for want of novelty and invention.

2. Defendant is entitled to its costs.

If the above findings of fact and conclusions of law are not regarded as a sufficient compliance with Rule 70½ of the Equity Rules, other findings of fact and conclusions of law may be submitted on notice.

Decree for defendant. Settle decree on notice.

Grover M. Moscowitz,
U. S. D. J.

UNITED STATES DISTRICT COURT 1291

EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY,
A CORPORATION,
Plaintiff,
against
MONTGOMERY, WARD & COMPANY,
A CORPORATION,
Defendant.

In Equity
No. 8417

Stipulation

(Filed April 26, 1938) 1292

It is hereby stipulated and agreed by and between the solicitors for the respective parties hereto, that the opinion of this court, filed in the above-entitled suit on April 11, 1938, shall stand as the Findings of Fact and Conclusions of Law as required by Equity Rule 70½.

Dated New York, N. Y., April 25, 1938.

DARBY & DARBY,
Solicitors for Plaintiff.

ANTHONY WILLIAM DELLER,
Solicitors for Defendant. 1293

1294 At a term of the United States District Court for the Eastern District of New York held at the Court House thereof in the Post Office Building, Borough of Brooklyn, within said Eastern District, on the 26th day of April, 1938.

Present: HONORABLE GROVER M. MOSCOWITZ, U. S. District Judge.

IN THE UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

1295 THE TOLEDO PRESSED STEEL COMPANY, A CORPORATION, *Plaintiff*,

vs.

MONTGOMERY WARD & CO., INC., A CORPORATION, *Defendant.*

In Equity No. E-8417

Final Decree

(Entered April 26, 1938)

This cause came on to be heard in open court on or about March 8, 1938, before His Honor, Judge
1296 Grover M. Moscowitz, and upon consideration of the pleadings, evidence, arguments of counsel and briefs, it is ordered, adjudged and decreed as follows:

1. That Claims 2, 5, 11 and 12 of patent to Withrow et al. No. 1,732,708, property of plaintiff herein, are void for want of novelty.

2. That Claims 2, 5, 11 and 12 of patent to Withrow et al. No. 1,732,708, are for aggregations and not for patentable combinations.

3. That the bill of complaint is hereby dismissed for want of equity. 1297

4. That the defendant shall recover costs from the plaintiff.

Enter:

Grover M. Moscowitz,
United States District Judge.

Approved as to form:

Darby & Darby,
Solicitors for Plaintiff.

Wilber Owen,
Of Counsel for Plaintiff.

1298

1299

1300 UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY, A CORPORATION, *Plaintiff*,
vs.
MONTGOMERY, WARD & CO., INC., A CORPORATION, *Defendant*.

Equity No. 8417

Petition for Appeal

1301 (Filed May 14, 1938)

The above-named plaintiff, feeling itself aggrieved by the final decree made and entered in the above-entitled cause on or about the 26th day of April, 1938, hereby does appeal from said final decree to the United States Circuit Court of Appeals for the Second Circuit, for the reasons set forth in the assignment of errors filed herewith and it prays that its appeal be allowed and that citation be issued as provided by law, directed to the above-named defendant Montgomery, Ward &
1302 Co., Inc., commanding it to appear before the United States Circuit Court of Appeals for the Second Circuit, to do and receive what may pertain to justice to be done in the premises, and that a transcript of the record, proceedings and documents upon which said decree was based, duly authenticated, be sent to the United States Circuit Court of Appeals for the Second Circuit.

DARBY & DARBY,
Solicitors for Plaintiff.

UNITED STATES DISTRICT COURT 1303

EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY, a CORPORATION, *Plaintiff*, vs. MONTGOMERY, WARD & CO., INC., a CORPORATION, *Defendant*.	Equity No. 8417

Assignment of Errors

(Filed May 4, 1938) 1304

Now comes the plaintiff in the above-entitled cause and files the following assignment of errors on which it will rely upon its prosecution of the appeal in the above-entitled cause from the decree made by this Honorable Court entered on or about the 26th day of April, 1938.

1. The District Court erred in holding claims 2, 5, 11 and 12 of Withrow and Close patent in suit #1,732,708 invalid for want of novelty.

2. The District Court erred in holding that claims 2, 5, 11 and 12 of said patent #1,732,708 1305 are aggregative in view of the McCloskey torch body (Plaintiff's Exhibit 27) and the flame guard manufactured by The Milwaukee Gas Specialty Company and exemplified by the hood of the patent to Rutz #1,101,146 of June 23, 1914, and shown in Defendant's Exhibit L.

3. The District Court erred in entering a decree dismissing the bill of complaint herein on the ground that claims 2, 5, 11 and 12 of Letters Patent #1,732,708 in suit are invalid.

4. The District Court erred in not holding claims

1306 2, 5, 11 and 12 of said patent valid and infringed by defendant, Montgomery, Ward & Co., Inc.

5. The District Court erred in holding that devices for maintaining the heat of a wick holder and wick to facilitate the vaporization of the fuel were well-known and in public use for more than two years before December 26, 1928, and that an example of such a device is shown in Russian patent to Malcov #1163 of the year 1868.

6. The District Court erred in holding that defendant is using a flame guard similar to the flame guard shown in defendant's Exhibit L except as to
1307 the size of the flame ports, and that the difference in size between the flame ports of defendant's structure and of the flame guard of Exhibit L is immaterial.

7. The District Court erred in holding that it would only be an act of mechanical skill to apply the Rutz flame guard to a torch body for the purpose of protecting the wick and flame thereof from wind and rain, or to devise means for maintaining the heat of the wick holder and wick.

8. The District Court erred in holding that the flame guard manufactured by the Milwaukee Gas
1308 Specialty Company (shown in Defendant's Exhibit L) may be employed without change for the purposes of the patent in suit.

9. The District Court erred in holding that the devices relied upon by the defendant as prior art anticipate the claims of said patent in suit and in not holding that such devices are for non-analogous uses and in non-analogous arts.

10. The District Court erred in holding that the testimony in this cause is substantially the same as the testimony before the Court of Appeals for the Sixth Circuit in Standard Parts, Inc. v. The

Toledo Pressed Steel Company (Reported 93 F. (2d) 336). 1309

11. The District Court erred in following the decision of the Circuit Court of Appeals for the Sixth Circuit in said Standard Parts, Inc. v. The Toledo Pressed Steel Company suit.

12. The District Court erred in not entering a decree for plaintiff for injunction against and for an accounting by said defendant by reason of infringement of claims 2, 5, 11 and 12 of said patent #1,732,708.

Wherefore, and for diverse other errors in the record of this cause appearing, plaintiff prays 1310
that the decree entered herein on the 26th day of April, 1938, be reversed in the above respects, and that the said District Court for the Eastern District of New York be ordered to enter a decree in full accordance herewith.

DARBY & DARBY,
Solicitors for Plaintiff.

1311

1312 UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY, A CORPORATION, *Plaintiff*, *vs.* MONTGOMERY, WARD & CO., INC., A CORPORATION, *Defendant.*	Equity No. 8417

Order Allowing Appeal

1313 (Filed May 4, 1938)

The plaintiff having presented its petition for appeal herein, it is ordered:

1. That the plaintiff's appeal is allowed as prayed for.

2. That the annexed stipulation by and between solicitors of the respective parties waiving the filing of a bond for security for costs on appeal to the Circuit Court of Appeals, is approved.

GROVER M. MOSCOWITZ,
United States District Judge.

1314

UNITED STATES DISTRICT COURT 1315

EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY, a CORPORATION, *Plaintiff*, *vs.* MONTGOMERY, WARD & CO., INC., a CORPORATION, *Defendant.*	Equity No. 8417

Citation

(Filed May 4, 1938) 1316

By the HONORABLE GROVER M. MOSCOWITZ, one of the judges of the District Court of the United States for the Eastern District of New York, in the Second Circuit:

To

MONTGOMERY, WARD & COMPANY, INC.

GREETINGS:

You are hereby cited and admonished to be and appear before a United States Circuit Court of Appeals for the Second Circuit, to be holden at the Borough of Manhattan, in the City of New York, 1317
in the District and Circuit above named, on the 4th day of June, 1938, pursuant to an appeal and assignment of errors filed in the Clerk's office of the District Court of the United States for the Eastern District of New York, wherein The Toledo Pressed Steel Company is plaintiff and you are defendant, to show cause, if any there be, why the errors in said appeal and assignment mentioned should not be corrected and speedy justice should not be done in that behalf.

1318 Given under my hand at the Borough of Brooklyn, County of Kings, in the City of New York, in the District and Circuit above named, this 4th day of May, in the year of our Lord One Thousand Nine Hundred and Thirty-eight, and of the Independence of the United States the One Hundred and Sixty-second.

Grover M. Moscowitz,
Judge of the District Court of the United States for the Eastern District of New York, in the Second Circuit.

1319

1320

IN THE UNITED STATES DISTRICT COURT 1321
EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY, a CORPORATION, *Plaintiff*, *vs.* MONTGOMERY, WARD & CO., INC., a CORPORATION, *Defendant.*	In Equity No. 8417

Stipulation as to Bond
(Filed May 4, 1938) 1322

It is stipulated and agreed by and between the solicitors for the respective parties that the filing of a bond for security for costs on appeal to the Circuit Court of Appeals in the above-entitled suit is hereby waived.

DARBY & DARBY,
Solicitors for Plaintiff.
A. W. DELLER,
Solicitor for Defendant.

1323

1324 IN THE UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY,
A CORPORATION,
Plaintiff,
vs.
MONTGOMERY, WARD & CO., INC.,
A CORPORATION,
Defendant.

In Equity
No. E-8417

Stipulation as to Contents of Record on Appeal

1325

It is hereby stipulated and agreed by and between the solicitors for the respective parties, subject to the approval of the Court, that the transcript of the record for the purposes of appeal shall contain:

1. Bill of Complaint.
2. Answer of Defendant.
3. Record of testimony in narrative form with the exception of the expert testimony of John C. Olsen on behalf of Plaintiff, and of Matthew Luckiesh on behalf of Defendant, which shall be repro-
1326 duced in question and answer form.
4. Plaintiff's Exhibits:

1, 2, 3, 4, 5, 8, 11 (only the side which contains sectioned view of torch), 12, 15 to 15-I, 16, 18, 24, 25, 27, 28 (first and last pages only), 29, 30, 32, 33 and 34.

5. Defendant's Exhibits:

B,

The following patents from Exhibit C:

Malcov (Russian)	No.	1,163
Salsbury (British		16,524
Von der Weide (Russian)		1,261

Hathaway	147,496	1327
Wall	228,497	
Heston	270,587	
Almond	193,796	
Blake	453,335	
Warren	783,339	
Rutz & Leuthe	1,009,184	
Rutz	1,101,146	
Kahn	1,175,527	
McCloskey	1,610,301	

and E, F, (Figs. 11, 23, 35, 36 and 37 only), G, H, (as narrated pursuant to stipulation), K and M.

6. Opinion of Judge Moscowitz. 1328

6A. Stipulation that Opinion of the Court stands as Finding of Fact and Conclusions of Law as required by Equity Rule 70½.

7. Final Decree.

8. Plaintiff's Petition for Appeal.

9. Plaintiff's Assignment of Errors.

10. Order Allowing Appeal.

11. Citation.

12. Stipulation as to Appeal Bond.

13. This Stipulation as to Transcript on Appeal.

14. Stipulation that Record is a true Transcript.

15. Clerk's Certificate. 1329

It is further stipulated that the narrative form of the depositions of Huber O. Croft and Elmer C. Lundquist filed by the defendant, and that of Philip A. Kerwin filed by plaintiff may be included in the transcript in lieu of the originals of said depositions in question and answer form.

It is further stipulated and agreed that the originals and such of the above exhibits as are reproduced in part in the record and all other exhibits, are to be treated as physical exhibits and certified

1330 by the Clerk to the Circuit Court of Appeals for the Second Circuit.

Darby & Darby,
Solicitors for Plaintiff.

A. W. Deller,
Solicitors for Defendant.

It is so ordered this 19th day of May, 1938,
1331 and the Clerk is directed to certify the record in accordance with the foregoing stipulation without requiring any praecipe or further approval of the evidence by the Court.

Grover M. Moscowitz,
United States District Judge.

1332

IN THE UNITED STATES DISTRICT COURT 1333

EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY, a CORPORATION, *Plaintiff*, *vs.* MONTGOMERY, WARD & CO., INC., a CORPORATION, *Defendant.*	In Equity No. 8417

Stipulation

1334

It is hereby stipulated and agreed, that the foregoing is a true copy of the transcript of the record of the District Court in the suit entitled The Toledo Pressed Steel Company vs. Montgomery, Ward & Co., Inc., Equity No. 8417, as agreed on by the parties.

DARBY & DARBY,
Solicitors for Plaintiff.

A. W. DELLER,
Solicitors for Defendant.

On reading the foregoing consent of the solici- 1335
tors for the respective parties herein, it is ordered that the foregoing printed record be filed in lieu of the original papers for the purpose of certifying the record on appeal.

GROVER M. MOSCOWITZ,
U. S. District Judge.

1336 IN THE UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

THE TOLEDO PRESSED STEEL COMPANY, A CORPORATION, *Plaintiff*, *vs.* MONTGOMERY, WARD & CO., INC., A CORPORATION, *Defendant*.	In Equity No. 8417

Clerk's Certificate

1337

I, PERCY G. B. GILKES, Clerk of the District Court of the United States of America for the Eastern District of New York, do hereby certify that the foregoing is a correct copy of the transcript of the printed record ordered filed by the said District Court in the suit entitled The Toledo Pressed Steel Company vs. Montgomery, Ward & Co., Inc., Equity No. 8417, as agreed on by the parties.

In testimony whereof, I have caused the seal of the said Court to be hereunto affixed at the City
1338 of New York, in the Eastern District of New York, this 2nd day of June, in the year of our Lord one thousand nine hundred and thirty-eight and of the Independence of the said United States the one hundred and sixty-second.

PERCY G. B. GILKES,
Clerk.

[fol. 447] United States Circuit Court of Appeals for the Second Circuit, October Term, 1938

Argued Oct. 14, 1938. Decided Nov. 7, 1938

No. 54

The Toledo Pressed Steel Company, Plaintiff-Appellant,

v.

Montgomery, Ward & Company, Defendant-Appellee

Appeal from the District Court of the United States for the Eastern District of New York

Before Manton, Swan, and Chase, Circuit Judges

Appeal from the District Court for the Eastern District of New York. Suit by Toledo Pressed Steel Co., plaintiff, against Montgomery, Ward & Company, defendant, for infringement of patent for a burner. Decree for defendant; plaintiff appeals. Reversed.

Darby & Darby, of New York City (Samuel E. Darby, Jr., of New York City, and Wilber Owen, of Toledo, Ohio, of counsel) for plaintiff.

Anthony William Deller, of New York City (Carl V. Wisner, Jr., of Chicago, Ill., of counsel), for appellee.

Manton, Circuit Judge:

This suit is for infringement of patent No. 1,732,708 granted October 22, 1929, on an application filed December 26, 1928 for a kerosene burning construction torch. Claims 2, 5, 11 and 12 [1] are sued on.

---

[1] 2. In a device of the class described, a torch body having an opening for a wick, and a flame guard for said wick mounted on the outside of said torch body, said guard including a cap provided with an imperforate top wall and lateral flame openings adapted to emit a luminescent flame, and air ports.

5. In a device of the class described, a construction torch having an opening in its upper end for a wick, means to hold

This torch is used as a warning signal on streets to make known obstructions on the highway. The patent states: "This invention relates to street torches, such as are commonly used for illuminating road obstructions, and usually referred to as construction torches, but more particularly to devices for increasing the efficiency of such torches and militating against extinguishment of the torch flame, and an object is to provide a simple and efficient attachment for torches of the above character for increasing the efficiency thereof and materially reducing the liability of extinguishment of the flame by high winds. Another object is to provide a burner so constructed and arranged that liability of [fol. 448] extinguishment of the flame by high winds or by rain is reduced to a minimum. * * *"

And further: "* * * It has been found that with the above described construction and arrangement, the oil consumption is materially decreased. It is also found that the amount of wick used is likewise decreased. Another outstanding advantage resides in reducing the liability of extinguishing the flame by high winds or rain."

Oil consumption by the burner of the patent in suit is reduced more than 50% as compared with its predecessor, the open flame torch; wick consumption which was from three-fourths of an inch to an inch and a quarter each night in the open flame torch was practically eliminated. It is

---

the wick in place, and a guard fitting over the outer end of the wick but spaced from the sides thereof, said guard having an imperforate top wall and side flame and air openings.

11. A burner for a construction torch adapted to emit a luminescent flame and comprising a wick holder having a portion in contact with the wick and a supporting and heat-receiving flange, and means enclosing a space above said flange and surrounding the wick, except for provision for lateral exit of flame and restricted entrance of air for combustion.

12. A burner for a construction torch adapted to emit a luminescent flame and comprising a wick holder having a portion in contact with the wick and lateral flange, and a cap enclosing and spaced from the end of the wick and having an imperforate top and provision for lateral exit of flame and entrance of air, and the bottom of the cap being in heat conducting relation to said flange.

undisputed that appellant and appellee's torches now pass all the tests imposed by the State Highway Departments, none of which are passed by the open flame torch. These advantages are obtained by substituting for the burner of the old open flame torch, which was a wick-tube and wick protruding from the container for oil, a burner in which the end of the wick-tube and wick are enclosed in a metal cap provided with suitable air inlets and flame outlets. The cap is supported on a flange which contacts the wick-tube and transmits heat to the wick-tube and wick to maintain the oil above the flash point and provide under all weather conditions a suitable supply of hydrocarbon vapor which escapes from the flame openings in the metal cap and burns outside the cap. Regardless of the effect of wind and rain on the flame outside the burner, the source of the flame inside the burner is protected and continues to supply the hydrocarbon vapor necessary to feed the flame which is the warning signal.

This patent was litigated in the Sixth Circuit where the Circuit Court of Appeals held it to be invalid. Standard Parts, Inc., v. Toledo Pressed Steel Co., 93 F. 2d 336. The court below felt obliged to follow that decision.

This record, however, contains evidence absent in the Standard Parts Case, showing that the art was in search for this accomplishment; that others worked unsuccessfully to solve the problem of producing a torch which would not only be more economical in the use of kerosene, but would remain lighted notwithstanding rain and wind. In the Standard Parts Case, it was said that the problem required no inventive thought. The proof here, not found in the Standard Parts Case, showed widely separate unsuccessful attempts to provide some means which would prevent the flame from being extinguished. Unsuccessful efforts were made over a long period by men skilled in the art of burners. The history of the art, as here shown, demonstrates that the accomplishment was not easy nor apparent nor merely the work of one skilled in the art. Hookless Fastener Co. v. G. E. Prentice Mfg. Co., 2 Cir., 68 F. 2d. 940, 941.

The open flame torch had been in use as a warning signal for many years. The usual type was a sheet metal container with a wick one and a half inches long; the wick was soaked with kerosene and burned from the sides as well as the top. It was referred to as a "bonfire of cotton fibre".

High fuel and wick consumption were the consequence. A strong wind would blow the flame away from the wick and cool the oil below the flash point, thus causing the flame to go out. If water soaked the wick, it would vaporize and cool the wick below the temperature at which the oil would burn and the flame would go out. Moreover, the flame produced was three or four inches in diameter and sometimes six to eight inches high of irregular shape, flickering and weaving from side to side with changing air currents.

The problem presented was to preserve this open unsteady flame and maintain it under all kinds of weather conditions without enclosing it. By the mechanical combination of parts shown in the patent, the results above referred to as to efficiency and economy were obtained. Kerosene gives off no combustible vapors at ordinary temperature, but must be heated to the flash point which runs up to 150° or 160° F. There is a small protected combustion chamber in the bottom of the cap in both appellant's and appellee's devices, provided with restricted air inlets, so that, when lighted, it has a little chamber where a little air is admitted, and which maintains the temperature of the wick to the point where it will give off vapor. The cap temperature was found on test to run as high as 780° F; the heat from the cap was conducted into the flange and into the tube surrounding the wick, and this heat would supplement the heat [fol. 449] from the small flame in the combustion zone and would succeed in maintaining the temperature of the wick tube and the kerosene which would be vaporized and keep the flame going. On tests it was found that high wind velocity did not seem to succeed in eliminating the flame or cooling the kerosene as used in both appellant's and appellee's burners. Both acted alike in that respect and both gave high temperature of feed.

That the problem required more than mechanical skill is demonstrated by the efforts and trials of those interested in its solution. The need for the general use of torches became more necessary with the general use of automobiles. The evidence shows that it has been the experience of those using the open flame torch that it blew out or was rained out and there was a real problem of securing a burner which would stand both rain and wind. Unsuccessful attempts have been made by competitors who had been long in the business of manufacturing and selling open flame torches.

The results of these experiments were placed upon the market and, until the burner under the patent in suit appeared, they had not solved the problem. When placed on the market, appellant's burner superseded open flame torches. Other manufacturers of sheet metal open flame torches soon abandoned their makes in favor of the patented type. Some competitors took out licenses under the patent; others brought out torches similar to the patented device and in so doing passed the tests prescribed by State Highway Departments for signal devices. It was only after a series of experiments extending over a long period that the inventor here succeeded. It was the protection of the source of the flame from wind and rain by means of the metal guard provided with suitable openings, thus insuring the maintenance of a small portion of the flame in a protected zone and utilizing the heat from this flame and the heat from the metal guard to maintain the temperature of the kerosene in the wick above the flash point which insured a supply of gaseous vapor at all times which would pass outside the guard and thereby provide the open and unprotected flame which formed the warning signal.

The prior art does not disclose or suggest the combination or result here obtained. The patent to Rutz No. 1,101,-146, granted June 23, 1914, had for its object "to provide a simple, economical and effective flash igniter for a series of gas stove burners, the same being grouped about the igniter and within the field of entrained jets of flame, which jets are emitted from the igniter under the control of the operator."

This device was used on a kitchen gas range and many of them were sold. The flame they are designed to protect is a small pilot light, which burns continuously and is so feeble that it might be extinguished by indoor drafts, such as the sudden closing of a door. The flame is completely enclosed within the metal cap. The principal function of this cap is materially different from any function of a burner of the patent in suit. The fuel is not the same. Rutz uses gas under pressure. The patentee here uses kerosene which must be vaporized before it will burn and when vaporized is not under pressure. There is the problem of heating the fuel to vaporize it. Rutz makes provision for cooling the cap by providing a substantial space between the pilot light and the cap walls, also by passing

a cylinder of air up through the vent openings in the supporting disk and out through vent openings near the top of the cap, whereas in the patent in suit the heat of the cap is utilized to assist in heating the kerosene in the wick above the flash point. In the Rutz patent there is no means for heating the cap if its use there were desirable. The pilot light is small and so far spaced from the cap that no substantial amount of heat will be transmitted to the cap, even in the absence of the rising cylinder of air inside the cap and along its walls. The flame which follows the jets of gas to the stove burners continues for only a fraction of a second and does not impinge upon the walls of the cap.

Heating the cap is very important in the patent in suit, one of its functions being to supply heat to the wick and the oil in the wick tube so as to raise the oil above the flash point. In the Rutz patent there was no problem of fuel or wick consumption, where as these were important considerations of the patent in suit. Rutz had no problem of maintaining the flame under conditions of wind and rain.

The Russian patent to Malcov, No. 1163 of 1868, is for a lamp burner of special construction. The description is meager and the drawing vague and it is justly so criticized. [fol. 450] The specifications refer to two tubes and state that between them "there remains a space into which may enter a third tube called regulator and intended for the adjusting of the size of the flame". Apparently it was intended to use charcoal which would become heated above the flash point of the oil and hydrocarbon vapors and would escape through the small perforations in the dome, where they would mix with the air and burn. The experts called were unable to understand the disclosure of this Russian patent. It does not anticipate the patent in suit.

In Rockwood v. General Fire Extinguisher Co., 2 Cir., 8 F. 2d 682, 686, we pointed out that if changes had to be made in the combination cited as in anticipation to make it a successful commercial device, it would not be such prior art as would invalidate a patent. But it is argued that appellant had sought a patent by attempting to obtain a monopoly on a new use for the Rutz structure. It is said that the appellant has attempted to take one element, the guard for the pilot light from the Rutz apparatus, and combine it with a fuel tank wick and wick holder of the prior art in such a manner as to accomplish to some degree, the functions and results of the patent in suit. But the device

here used as a warning signal—the burner—must be considered as an entirety, that is, the oil container, the wick, the wick tube and the top. Dwight & Lloyd Sintering Co. v. Greenawalt, 2 Cir., 27 F. 2d 823; Traitel Marble Co. v. U. T. Hungerford Brass & Copper Co., 2 Cir., 18 F. 2d 66, 68. While torch bodies and flame guards were old, they have never been used together to perform the function or produce the results of the device of the patent in suit. If they were ever combined for any purpose, it was not to protect the flame at its source so as to provide a small protected chamber in which some part of the flame would continue to burn regardless of outside weather conditions, with the greater and visible part of the flame burning as a warning signal outside the guard. This combination and use amounted to invention. Instead of being for a combination of elements whose novelty depends upon an improvement of one of the elements without change of function or result of combination in its entirety, this patent covers a unitary structure patented as an entirety. Westinghouse Electric & Mfg. Co. v. Wagner Electric & Mfg. Co., 225 U. S. 604, 32 S. Ct. 691, 56 L. Ed. 1222, 41 L. R. A., N. S., 653; Elizabeth v. Pavement Co., 97 U. S. 126, 24 L. Ed. 1000; Stromberg Motor Devices Co. v. Zenith-Detroit Corp., 2 Cir., 73 F. 2d 62.

But defendant says it avoids infringement because in its device the flange which supports the cap is elevated a short distance above the body of the torch and the air inlet openings are located in this supporting flange instead of in the side of the cap. No statement in the claims of specifications requires that the cap rest directly on the body of the torch, nor that the air inlet ports be located in the body of the cap. The patentees state that while they have shown and described the constructions "which admirably fulfill the objects primarily enumerated, it is to be understood that the above description * * * is given by way of illustration and not of limitation.

Claim 2 calls for a "flame guard for said wick mounted on the outside of said torch body, said guard including * * * air ports." In appellee's device the flame guard is mounted on the outside of the torch body. There is no doubt that the flame guard includes both the cap and its supporting flange and that the flame guard includes air ports.

Claim 5 calls for "a guard fitting over the outer end of the wick * * *, said guard having an imperforate top

wall and side flame with air openings". Considering the guard as including both cap and supporting flange, appellee's flare has air openings in the guard at the side of the wick,—an important consideration,—rather than locating them in the side of the cap.

The non-infringement of claim 11 is based on the claim that appellee has separated the wick-tube-supporting and heat-receiving portions of the flange of the patent. But this overlooks the rule that infringement cannot be avoided by substituting two parts for a single part of a patented structure when the two parts perform the same function as does the single part of the patent. Arthur Colton Co. v. McKesson & Robbins Inc., 2 Cir., 58 F. 2d 157, 158; Line Material Co. v. Brady Electric Mfg. Co., 2 Cir., 7 F. 2d 48, 50.

As to claim 12, it is contended that the word "lateral" applies to the location of the air openings and requires that [fol. 451] they be in the cap. The air inlets in the supporting flange of the appellee's flare are located laterally with respect to the wick and wick tube, as are the air inlets of appellant's device.

These arguments, as to non-infringement, fail to give effect to the established rules that infringement exists if the substance of the invention which is defined by the claims, as distinguished from its form, is appropriated, and that infringement of a combination claim is not avoided by reason of the fact that the appellee is free to use some or all of the separate elements of the combination because they existed in the prior art. Smith v. Snow, 294 U. S. 1, 55 S. Ct. 279, 79 L. Ed. 721; Winans v. Denmead, 15 How. 330, 56 U. S. 330, 14 L. Ed. 717; Sanitary Refrigerator Co. v. Winters, 280 U. S. 30, 50 S. Ct. 9, 74 L. Ed. 147; Hillard v. Fisher Book Typewriter Co., 2 Cir., 159 F. 439, 442.

On this record we hold that invention has been established and that the appellee's device infringes the claims here sued on.

Decree reversed.

Chase, Circuit Judge, dissenting without opinion.

IN THE

United States Circuit Court of Appeals

FOR THE SECOND CIRCUIT

No. 54.

The Toledo Pressed Steel Company,
Plaintiff-Appellant,

vs.

Montgomery Ward & Company, Inc.,
Defendant-Appellee.

PETITION FOR REHEARING

May It Please the Court:

Now comes Montgomery Ward & Company, Inc., defendant-appellee, and files this, its petition for rehearing, and respectfully prays that it may have a rehearing of the above-entitled cause.

It is respectfully urged that the opinion of the Court, in holding *valid* the patent in suit previously held *invalid* by the Circuit Court of Appeals for the Sixth Circuit (*Standard Parts, Inc. v. Toledo Pressed Steel Company,* 93 F (2nd) 338), has misapprehended the record and has departed from long-established principles of the patent

law. In view of the propriety in the instant case of *certiorari* to the Supreme Court to resolve the conflict between the Second and Sixth Circuits as to the validity of the patent in suit, it would seem proper to point out the record facts which, in our judgment, require an affirmance of the District Court's decree.

Statement.

In order to reach the conclusion that reversal was necessary in the instant case, the Court has to adopt in their entirety certain propositions which, for convenience, may be tabulated as follows:

(*a*) "Unsuccessful efforts (to solve the problem) were made over a long period by men skilled in the art of burners"; this was supposed to be new evidence which differentiated the instant case from the Standard Parts case in the Sixth Circuit.

(*b*) It was assumed that the combination of a torch body, a wick and a flame guard was novel, although the record shows the precise combination in Wall, No. 228,497 of the year 1880. A supplementary assumption was that the combination of any type of flame guard structure with a fuel reservoir can amount to invention.

(*c*) It was assumed that an environmental change was the equivalent of a functional change.

(*d*) It was assumed either that defendant was not using the Rutz structure in its device, or that the adaption of that structure to a torch body amounted to invention.

(*e*) The Court overlooked clear statements in the specification in holding that: "No statement * * * requires * * * that the air inlet ports be located in the body of the cap."

(*f*) The Court's conclusion that the structure of the patent effected fuel savings and acted as a generator is not borne out by the record.

I.

The Court based its departure from the ruling of the Sixth Circuit upon the theory that new evidence was presented in the instant case, which may be summarized in the following statements from the opinion: "That others worked unsuccessfully to solve the problem (p. 3). The proof here * * * showed widely separated unsuccessful attempts * * *. Unsuccessful efforts were made over a long period by men skilled in the art of burners * * * (p. 4). Unsuccessful attempts have been made by competitors who have long been in the business of manufacturing and selling open flame torches * * *" (p. 5).

To support its theory in this regard, appellant produced two isolated instances. The first was that of a Superintendent of Way and Structures of the Detroit Street Railway, who in 1922 made one attempt to protect the flame by placing a flat shield over the top of the structure. This experiment continued from 1922 to 1924. It was abandoned, according to the witness, because the pin supporting the shield "would be bent and sometimes broken * * * and we still had trouble with

the torches being extinguished in a drenching rain or in a very high wind, and so we concluded that those happenings were so infrequent that we could just as well get along without the cap, and we discontinued the use'' (Rec. 59, f. 176).

This evidence may be eliminated as a support for the Court's discussion of efforts by others in the industry. The experimenter was not a manufacturer of torches, there was no showing that he had any knowledge of combustion or of the structure of hydrocarbon burners. The showing is that he made but one experiment and that it was abandoned for reasons quoted above.

The other evidence offered is that of Currie, Works Manager for the Dietz Company, a large lantern manufacturer. While we have pointed out at some length in our brief (pp. 5, 26-27), the unreliability of Currie's evidence, the Court evidently drew the impression from his testimony that he had long been struggling with the problem. It is submitted that he had not. In 1928, something more than a year after the Toledo torch first came on the market, Currie found that it would not stand up in a "heavy rain. There was nothing to protect it at all'' (Rec. 168, f. 504). During his experiments, he produced three devices, one of them being Exhibit 37, which "would operate with a much lower wick and withstand a very high wind'' (Rec. 171, f. 511). He further testified: "I tried it out in the rain and it went out. It occurred to me that I might possibly put a flat shield over the top so that the rain would not get in the wick, that is, that thought must have

been in my mind, but I just didn't do it" (Rec. 175, f. 523). It is further significant that Currie, whose company maintained a complete file of patents, did not familiarize himself with the Rutz patent, for example, in 1928 when he was doing the work. He familiarized himself with that patent around 1930 or 1931 (Rec. 174, f. 520).

Such is the testimony which the Court says makes valid a patent heretofore held void for want of invention. We respectfully submit that it offers no foundation to support the conclusion that the art herein involved was one in which there had been a long, unsuccessful struggle to produce an efficacious device. It seems rather to be one in which the problem yielded readily to the first experimenter who seriously attacked it, to paraphrase the language of *National Electric Products Company* v. *Circle Flexible Conduit Company*, C. C. A. 2, 86 F (2nd) 84, 88.

A further comment on Currie's activities is that they were those of a conscious imitator. His company's lantern sales suffered when the Toledo torch came on the market in 1927 (Rec. 168 f. 502); during 1928 he experimented with the open flame torch and found that it would go out (Rec. 168, f. 504). During that year he produced Exhibit 37, which "would operate with a much lower wick and withstand a very high wind" (Rec. 171, f. 511). In January, 1929, Toledo put its protected torch on the market and in that year, Currie produced Exhibits 38 and 39, the latter being a housing somewhat similar to the housing for the new Toledo torch (Rec. 171, ff. 511-513). Subsequent-

ly, Currie's company took a license which, among other things, required that his testimony be available to plaintiffs (Rec. 173, f. 517). His testimony therefore should be considered in the same light as that of the officers of the plaintiff.

Currie, obviously, was not an independent researcher or an original thinker in this field. His activities, when studied, do not justify the impression which the Court received.

II.

It is respectfully submitted that the assumption that the combination of a flame guard and a torch body could be novel is not only in direct conflict with the conclusions which the Sixth Circuit reached upon different art than that here stressed, but it is also contrary to the disclosures in the record of the instant case.

A specific citation disclosing the combination of a torch body, wick and protecting burner is Patrick Wall's mill lamp, No. 228,497 of June 8, 1880 (Rec. 344). The patent drawings show a torch body A, a wick and wick tube E and a burner G. Inside of the burner is a little flame which burns "in a broad sheet" through the slot in the burner. We did not offer the patent as anticipatory since it does not have the imperforate top mentioned in the claims of the patent in suit. It was used to provide light in a rolling mill, where except for rain, conditions are not substantially different from those found outdoors. It shows beyond any basis for argument that the broad concept of surrounding the flame of a wick with some sort of a protective guard lacks novelty.

III.

We have relied strongly on Rutz, No. 1,101,146 as anticipating claims 11 and 12, and as giving defendant the right to use a similar structure, irrespective of the validity or invalidity of plaintiff's patent. The record shows that an actual Rutz burner, placed on a torch body, will perform as well as the structure of the patent drawings, including being qualified for sale as a truck flare (Rec. 413-423). It meets the severest of state laboratory tests. In the words of *Dwight & Lloyd Sintering Company* v. *Greenawalt*, 27 F. (2nd) 823; and *Ingersoll-Rand Company* v. *Worthington etc. Company*, 87 F. (2nd) 320: "It can be used without change for the purposes of the patent in suit."

Of Rutz, the Court has said: "Rutz had no problem of maintaining the flame under conditions of wind and rain" (pp. 7-8). In reaching such a conclusion, it is believed the Court overlooked the testimony of Oscar J. Liens (Rec. 391, 393), a man who was associated with Rutz in the manufacture of the device and who was familiar with the problems which Rutz sought to overcome. Objects which the inventor had in mind were to protect the flame from precipitated liquids and from lateral currents of air (Rec. 393, f. 1177). A pot which boils over precipitates a liquid with greater intensity than any rain, and a wind is a wind, whether it blows on the highway or through an open kitchen door.

Appellant does not contend that there was any *structural change* in the Rutz burner which was

qualified in Nebraska. The only change was *environmental.* This is no more than saying that patentee found "a new use" or environment for the Rutz burner. When placed in that new environment, without structural change, it will perform every function of the patent in suit. As we have previously pointed out, there is no novelty in placing a burner around a wick tube on a torch body, e.g. Wall, No. 228,497. It is therefore submitted that the Court's statement on page 9, referring to the combination of Rutz with a torch body, "this combination and use amounted to invention," was based on the erroneous assumption that the combination of a torch body and a burner involved inventive thought; the combination, in fact, was old and the novelty, if any, necessarily lay in the burner construction.

For this reason, we submit that claims 2 and 5, covering such a combination, are aggregative within the meaning of *Lincoln Engineering Company* v. *Stewart Warner Corporation,* 82 L. ed. Adv. p. 695. Claims 11 and 12 are not combination claims directed to the association of a burner and a torch body, but deal with a burner alone. If it be the holding of the Court that the Rutz burner does not anticipate the burner delineated in claims 11 and 12, defendant must necessarily be free to use that burner, because that which does not anticipate cannot infringe.

It is further submitted that the "unitary structure" theory put forward by plaintiffs and adopted by the Court is untenable when one of the elements of a "unitary structure" is a fuel reservoir.

Multiplication of examples shows the fallacy. In *Stromberg Motor Devices Company* v. *Zenith Detroit Corporation*, 25 F. (2nd) 567, a carburetor was held to be a unitary structure, Judge L. Hand dissenting. Can we suppose for a moment that the carburetor and the gas tank at the back of the automobile would have been held a unitary structure?

Yet, in an equivalent manner, that is what plaintiff is asking here. But given the burner, it takes no invention to combine it with a fuel reservoir, as anyone would know that a burner intended to protect a flame would not function without fuel.

Thus a boiler and a coal supply, an electric light and the dynamo in the power house, a carburetor and a gasoline tank, a street sprinkler and water supply (*In re Ratican*, 36 App. D. C. 95) cannot be unitary structures.

This distinction was pointed out in *Bassick Manufacturing Company* v. *Adams Grease Gun Corporation*, 52 F. (2nd) 36, 38 by Judge Swan, where it was said:

> "The invention in a combination is in the idea of combining the elements. They may all be old, but the combination may be patentable. A fortiori this may be true when one element is also new as was the pin fitting of the claims under discussion. The element may be patented alone, and the combination also, if new and an invention. *But the introduction of the new element into the combination may be obvious;* though by hypothesis the combination must be new, because there is a new element, the *substitution of this for its predecessors may be obvious once it appears.* Otherwise one could

> get an indefinite monopoly upon all possible combinations with anything which is itself an invention, e.g., upon the lid and the new patent lock which secures it, upon the fixture and the new patent gas which feeds it. Plainly you could not get a patent for such a combination, because, given the lock or the gas, it takes no invention to combine it with these things." (Italics ours.)

That the "introduction of the new element into the combination" was obvious in the instant case is abundantly apparent from the experiments of the patentees, shown on pages 271 to 287 of the record. The first attempt was a lateral housing for the flame (Rec. 271). Such improvement as took place was not in the torch body, not in the fuel, but solely concerned itself with the housing surrounding the flame. It was obvious at once, not only to the patentees, but also to Currie and Kerwin, said to have been unsuccessful investigators in the art, that what was needed was a housing for the flame.

Plainly, then, the Court has departed from well-recognized principles in holding that the combination of a fuel tank and a burner produces a unitary structure. If it does not, claims 2 and 5 must fail, and claims 11 and 12, must be distinguished from Rutz, which defendant uses.

IV.

The Court below found that defendant was using the Rutz structure (Rec. 430, Finding 7). This reference was not to the precise structure disclosed in the Rutz patent, but to the commercial struc-

ture manufactured by the Milwaukee Gas Specialty Company. The record, in fact, affords no testimony to the contrary, and plaintiff has had to take the position that, irrespective of the fact that the Rutz structure has long been in public use for protecting flames from wind and from the equivalent of rain, defendant cannot use the same without answering for patent infringement.

While this Court did not specifically make a finding as to the defendant's use of the Rutz structure, it did hold, on page 11 of the opinion, that the defendant is not free to use some or all of the separate elements of a combination simply because they existed in the prior art.

It is believed that the Court has here taken a substantial departure from its established precepts of the patent law.

The prior art affords examples of torch bodies, wick tubes and protective burners around the top of the wick tube; in Rutz it affords an example of a burner with an imperforate top, flame ports in the side and air inlets in the bottom. If defendant is not free to assemble these elements in any way that it sees fit, it must be because plaintiff's patent covers *a new use for the Rutz structure.* That it is not entitled to such *new use* has been held by this Court several times, c.f. *Dwight & Lloyd Sintering Company* v. *Greenawalt*, 27 F. (2nd) 823; *Ingersoll-Rand Company* v. *Worthington etc. Company*, 87 F. (2nd) 320.

V.

It is believed that the Court has misunderstood the statements of the patent specification when it says, on page 9 of the opinion:

> "No statement in the claims or specifications requires that the cap rest directly on the body of the torch, nor that the air inlet ports be located in the body of the cap."

The specification states (p. 1, 11, 78-87):

> "Air inlet openings 10 *being above the lower edge of the cap* leaves a space within the cap *and above the flange* of the wick holder for comparatively quiescent air. This quiescent layer of air in contact with the wick holder and the restriction of inlet ports to admit to the wick and holder only such air as is needed for combustion aids in maintaining the heat of the wick holder and wick." (Italics ours.)

This limitation must be completely disregarded to find infringement.

The air inlet ports *must be above the edge of the cap* if the device is to operate in accordance with the specification. In the defendant's device, there cannot be a layer of quiescent air under any conditions of operation (Rec. 91, f. 271). After a series of the most careful tests, Professor Croft of the University of Iowa concluded that there was a difference in performance of the plaintiff's and defendant's devices and "that the difference in performance of the two flares can be accounted for by the difference in construction of the two flares. That is, in the Toledo flare, the wick and flame

guard are adjacent to the top of the body of the flare *and the air ports are in the sides of the flame guard,* while in the Anthes flare the wick and receptacle are elevated above the body of the top of the flare *and the air ports are in the bottom of flame guard receptacle*" (Rec. 155, f. 464. (Italics ours.)

Thus the Court's assumption that patentees did not restrict themselves is unwarranted; the only form in which the device can operate as described is the form disclosed in the specification and patent drawings, with *the air inlet ports above the edge of the cap.* A claim is not to be taken alone. It must be considered in connection with the specification and drawings, and while a patent claim may cover more than is illustrated and described, it may not cover something contrary to what is illustrated and described.

VI.

In the Sixth Circuit case, where the evidence offered by plaintiff was substantially similar to that offered here, except for evidence of "unsuccessful efforts * * * made over a long period by men skilled in the art of burners," Judge Simons found:

> "Stripped of variations in nomenclature, and the ingeniously differentiated phrases of counsel, the invention is for a burner with a metal guard to protect the flame from air currents and rain" (Rec. 427).

It would unduly extend this petition to analyze the Court's findings to the contrary in the instant

case, but the impression received from a reading of the opinion is that the Court conceived the device of the patent in suit as a generator, performing unique functions in maintaining the heat of the wick, and saving fuel.

It is submitted that an analysis of the record in the instant case completely confirms Judge Simon's characterization of the patented structure. Professor Croft's careful tests proved that, other things being equal, the addition of a flame guard did not bring about a fuel saving except in conditions of still air (Rec. 154, f. 460). His findings in detail are set forth on pages 407 to 409 of the record. Plaintiff's only testimony on fuel saving is based on tests between an open flame torch much larger than the protected torch, with the wick of the open flame torch extended an inch and a half as against one-eighth of an inch for the protected torch (compare devices B and C., Rec. 261). Professor Croft's tests showed that the one-half inch extension gave the best results (Rec. 397) and this accords with the practice of the Detroit Street Railway (Rec. 58, f. 173-174), which still uses the open flame torch.

Plaintiff's own expert shows that the principal factor in maintaining wick heat is the flame (Rec. 215-219, XQ 83, 100, 101, 104, 123-126), and the record also shows that the possibilities of conducting heat to the wick were public property long before patentees filed their application (Rec. 81, f. 241-242, referring to Luckiesh on Artificial Light, p. 60). As plaintiff's expert states in reference to maintaining wick heat (Rec. 232, XQ. 241):

"You can design a thing for it to become hot, and you can design for it not to become hot, prevent it from becoming hot, and you can leave it alone to take its course. You can do any one of these three things."

From all of which would appear that patentees were using known methods to produce known results in designing the structure of the patent in suit.

Conclusion.

It is respectfully urged that this Court critically reexamine this record in the light of its opinion. It is earnestly contended that the patent law does not give its monopoly to an improvement so obvious as the combination of a guard with an open flame torch to protect the flame from wind and rain. More than this, the patentee in the instant case did not do. Improvements in an art, to be patentable, must rise to a higher level of creative thought than that, apart from the test of novelty.

If defendant cannot combine a burner which preceded the patent in public use by thirteen years with a torch body whose use goes back beyond the memory of man, when other burners have been so combined with torch bodies at least as early as 1880, it seems desirable to have the grounds of the patentee's monopoly distinctly pointed out.

A clear-cut conflict between the circuits is shown. A District Judge in the Sixth Circuit found the patent valid and infringed. The Circuit Court of Appeals for the Sixth Circuit, without dissent, found the patent to be invalid. A Dis-

trict Judge for the Second Circuit found the patent to be invalid. The present decision is by a divided court.

All of which is respectfully submitted.

ANTHONY WILLIAM DELLER,
Solicitor for Appellee.

CARL V. WISNER, JR.,
Of Counsel.

We, Anthony William Deller, solicitor for appellee in the above-entitled cause, and Carl V. Wisner, Jr., of counsel therein, do hereby certify that the foregoing petition for rehearing is, in our opinion, well taken in point of law and has not been filed herein for purposes of delay.

ANTHONY WILLIAM DELLER,
CARL V. WISNER, JR.

[fol. 469] UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SECOND CIRCUIT

THE TOLEDO PRESSED STEEL COMPANY, Plaintiff-Appellant,

against

MONTGOMERY WARD & COMPANY, INC., Defendant-Appellee

Before: Manton, Swan and Chase, Circuit Judges

Anthony William Deller, Solicitor for Appellee. Carl V. Wisner, Jr., of Counsel.

Per CURIAM:

Petition for rehearing denied.

—— ——, Circuit Judges.

Filed Dec. 5/38.

[fol. 470] UNITED STATES CIRCUIT COURT OF APPEALS, SECOND CIRCUIT

At a stated term of the United States Circuit Court of Appeals, in and for the Second Circuit, held at the United States Court House, in the City of New York, on the 5th day of December, one thousand nine hundred and thirty-eight.

Present: Hon. Martin T. Manton, Hon. Thomas W. Swan, Hon. Harrie B. Chase, Circuit Judges.

TOLEDO PRESSED STEEL COMPANY, Plaintiff-Appelleent,

vs.

MONTGOMERY WARD & COMPANY, INC., Defendant-Appellee

A petition for a rehearing having been filed herein by counsel for the appellee;

Upon consideration thereof, it is

Ordered that said petition be and hereby is denied.

Wm. Parkin, Clerk.

[fol. 471] [Endorsed:] United States Circuit Court of Appeals, Second Circuit. Toledo Pressed Steel Company vs.

2—9527

Montgomery Ward & Company, Inc. Order. United States Circuit Court of Appeals, Second Circuit. Filed Dec. 5, 1938. William Parkin, Clerk.

[fol. 472] UNITED STATES CIRCUIT COURT OF APPEALS, SECOND CIRCUIT

At a stated term of the United States Circuit Court of Appeals, in and for the Second Circuit, held at the United States Court House, in the City of New York, on the 7th day of December, one thousand nine hundred and thirty-eight.

Present: Hon. Martin T. Manton, Hon. Thomas W. Swan, Hon. Harrie B. Chase, Circuit Judges.

TOLEDO PRESSED STEEL COMPANY, Plaintiff-Appellant,

vs.

MONTGOMERY WARD & COMPANY, INC., Defendant-Appellee

Appeal from the District Court of the United States for the Eastern District of New York

This cause came on to be heard on the transcript of record from the District Court of the United States for the Eastern District of New York, and was argued by counsel.

On Consideration Whereof, it is now hereby ordered, adjudged, and decreed that the decree of said District Court be and it hereby is reversed with costs.

It is further ordered that a mandate issue to the said District Court in accordance with this decree.

Wm. Parkin, Clerk.

[fol. 473] [Endorsed:] United States Circuit Court of Appeals, Second Circuit. Toledo Pressed Steel Company vs. Montgomery Ward & Company. Order for Mandate. United States Circuit Court of Appeals, Second Circuit. Filed Dec. 7, 1938. William Parkin, Clerk.

[fol. 474] UNITED STATES OF AMERICA,
Southern District of New York:

I, William Parkin, Clerk of the United States Circuit Court of Appeals for the Second Circuit, do hereby certify

that the foregoing pages, numbered from 1 to 473, inclusive, contain a true and complete transcript of the record and proceedings had in said Court, in the case of Toledo Pressed Steel Company, Plaintiff-Appellant, against Montgomery Ward & Company, Inc., Defendant-Appellee, as the same remain of record and on file in my office.

In Testimony Whereof, I have caused the seal of the said Court to be hereunto affixed, at the City of New York, in the Southern District of New York, in the Second Circuit, this seventh, day of December, in the year of our Lord one thousand nine hundred and thirty-eight, and of the Independence of the said United States the one hundred and sixty-*ht*ird.

Wm. Parkin, Clerk. (Seal United States Circuit Court of Appeals, Second Circuit.)

[fol. 475] SUPREME COURT OF THE UNITED STATES

ORDER ALLOWING CERTIORARI—Filed February 6, 1939

The petition herein for a writ of certiorari to the United States Circuit Court of Appeals for the Second Circuit is granted, and the case is assigned for argument immediately following Nos. 166 and 167.

And it is further ordered that the duly certified copy of the transcript of the proceedings below which accompanied the petition shall be treated as though filed in response to such writ.